Hydro Québec

# Strategic Plan **2002-2006**

# *Hydro-Québec,*
## a business-driven publicly owned company

### Mission

***"The objects of the Corporation are to supply power and to pursue endeavours in energy-related research and promotion, energy conversion and conservation, and any field connected with or related to power or energy."***

***Hydro-Québec Act, Sec. 22***

### Vision

***To become a world leader in energy***

**By developing its expertise for the benefit of its customers, employees and shareholder, and by working with partners in business ventures.**

### Values

- Customer satisfaction
- "Business first" approach
- Respect for employees
- Quality improvement
- Respect for the environment, in cooperation with local communities
- Safeguarding the future

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The *Strategic Plan 2002–2006* must be submitted to the Québec government on or before November 1, 2001. It will be subject to review by a parliamentary commission of the National Assembly within three months following the date on which it was tabled.

***Note to the reader***

*Unless otherwise indicated, monetary amounts in the text are expressed in Canadian dollars ($) and cents (¢).*

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# Summary

Opening of the electricity market and the widespread use of new technologies have radically changed the power industry in recent years. Hydro-Québec has adjusted quickly to this new business environment by becoming more efficient and by playing an active role on the wholesale market.

In Québec, the adoption of the *Act to amend the Act respecting the Régie de l'énergie* has established a heritage pool giving Québec consumers access to a maximum of 165 TWh of electricity per year at an average commodity rate of 2.79 cents per kilowatthour. This is the lowest rate for such a large quantity of energy in North America. Above that volume, supply for the Québec market will be ensured through competitive bidding, leading to the signing of supply contracts based on market price.

Elsewhere in Canada, only British Columbia and Alberta have opened their wholesale markets to competition, with Alberta also partially opening its retail market. In Ontario, opening of the wholesale and retail markets is now slated for May 2002, while New Brunswick is expected to open its market partially in 2003.

In the United States, market opening led to an upsurge in sales and trading transactions, resulting in a decline in wholesale electricity prices until the summer of 1999. In 2000, soaring fuel prices sent electricity prices skyward, especially in California. However, in 2001, electricity prices fell as a result of the drop in fuel prices and the commissioning of new generating plants.

Around the world, there are numerous business opportunities in power generation and transmission, as well as engineering and construction. However, the competition on this global market has intensified. Companies that succeed are those that focus on sectors where they can use their world-class expertise and know-how to manage risks more effectively than their competitors.

With this in mind, Hydro-Québec will focus its international activities on high-voltage transmission and the management of hydroelectric generation, areas in which the company excels.

## Improving Hydro-Québec's Overall Performance

Hydro-Québec plans to consolidate the progress made with respect to the major goals set forth in the *Hydro-Québec Act* and the Québec Energy Policy:

- Supply high-quality electric power to all Québec customers.
- Manage its activities so as to create value for the shareholder.

Building on its strengths, Hydro-Québec will concentrate on improving overall performance in terms of five key issues:

- quality of customer service
- employee motivation and expertise
- creating value for the shareholder and Québec society
- technological innovation
- efficiency and synergy of activities

## Quality of customer service

To serve its customers well, Hydro-Québec is committed to consolidating the improvements it has made to service quality. With respect to rates, the company has taken note of the Québec government's request not to increase rates for 2002 and 2003. However, it must consider raising rates as of 2004, in order to generate a normal return in a regulated environment.

## Employee motivation and expertise

Like most North American companies, Hydro-Québec must come to terms with the aging of a large segment of its work force. Furthermore, the company faces new challenges that call for new skills. Hydro-Québec is intent not only on renewing its work force, with priority given to strategic and vulnerable jobs, but also on stepping up efforts to recruit people with the appropriate new skills. It will also take further steps to rally its employees around shared goals. Another priority is the implementation of efficient management methods that focus specifically on knowledge maintenance and transfer, and improving work organization by soliciting the participation of employee representatives.

## Creating value for the shareholder and Québec society

Pursuing its profitability and value creation objectives, Hydro-Québec will continue to develop its generating facilities and electricity sales on the Québec retail market as well as on wholesale markets. While gradually improving its financial position, the company will help support economic development and employment in all regions of Québec. Hydro-Québec will also participate in the diversification of the Québec economy. Its industrial business development efforts will target value-added sectors, with a view to creating maximum wealth and jobs in Québec for each megawatt of new industrial demand.

## Technological innovation

Hydro-Québec intends to maintain its leadership in technology and to increase the benefits derived therefrom.

Hydro-Québec will consolidate its proactive management of technological innovation, redefined according to the following criteria:

- integrated management, an approach that relates all aspects of an innovation to its eventual use in the power system and on customer premises, combined with commercialization where appropriate;
- market intelligence conducted through profitable venture-capital investments, making it easier to identify emerging technologies associated with the company's core activities and expanding knowledge of the energy sector's technological market;
- long-term vision, allowing the company to prepare for foreseeable future breakthroughs and thus ensure its long-term viability.

## Efficiency and synergy of activities

The new regulatory environment in North America has obliged most vertically integrated electricity companies to restructure their activities according to operating segment: generation, transmission and distribution. In keeping with this trend, Hydro-Québec has created four business divisions covering its core activities:

- Hydro-Québec Distribution
- TransÉnergie
- Hydro-Québec Production
- Hydro-Québec Ingénierie, approvisionnement et construction

Ambitious targets have been set for each division and progress in achieving them will be evaluated by specific indicators. Ultimately, the company's overall performance will depend on rigorous management that holds each division accountable for optimizing its own processes and business objectives.

# Orientations of the *Strategic Plan 2002–2006*

The orientations proposed in the Strategic Plan are presented below and classified according to the responsibilities of Hydro-Québec's four divisions.

## Hydro-Québec Distribution

### Orientation 1

**Serve Québec customers well**

Hydro-Québec Distribution has improved customer service in recent years. It plans to consolidate its service performance, in three ways:

- Ensure reliable electric power.
- Offer products and services tailored to customer needs.
- Act responsibly towards society and the environment.

In order to guarantee a reliable supply for Québec customers, Hydro-Québec Distribution will submit its first *Electricity Supply Plan* to the Régie de l'énergie in the fall of 2001. This step will be followed in 2002 by an initial call for tenders to supply the portion of Québec demand that is expected to exceed the heritage pool in 2006–2007. Furthermore, Hydro-Québec Distribution may issue short-term solicitations, if necessary and at the appropriate time, in order to manage fluctuations in demand.

### Orientation 2

**Improve the division's profitability**

To improve its profitability and efficiency, Hydro-Québec Distribution plans to strictly control its costs, continue to develop its most profitable markets, improve demand management and energy efficiency in Québec, and request rate increases in 2004, 2005 and 2006, while avoiding a rate shock for customers.

## TransÉnergie

### Orientation 1

**Offer customers value-added transmission service**

Meeting the highest industry standards, TransÉnergie is able to offer its customers reliable and high-quality transmission service.

TransÉnergie plans to update its business practices and, if necessary, the Hydro-Québec transmission service contract adopted in 1997, taking into account the new rules being developed by neighboring systems. The division will also ensure that rules of reciprocity are applied by neighboring systems, especially when the Ontario and New Brunswick markets are opened.

### Orientation 2

**Maintain the reliability and integrity of the system operated by TransÉnergie, the only regional transmission organization in Québec**

TransÉnergie will continue performing all the functions of its role as an integrated transmission provider in Québec. To this end, the division plans to ask the Régie de l'énergie to approve the reliability and security rules which it already applies. In so doing, TransÉnergie will raise its profile as the manager responsible for reliability and security in the Québec Control Area and for the marketing of capacity on its system.

### Orientation 3

**Ensure the division's profitability, in particular by seizing international business opportunities**

Maintaining TransÉnergie's profitability, with a view to creating shareholder value, involves controlling expenses, generating a reasonable return on transmission activities in Québec, and seeking international business opportunities.

Hydro-Québec's expertise in the area of high-voltage transmission is in great demand throughout the world. Over the Strategic Plan period, the company expects to invest up to $300 million in additional capital in transmission projects on international markets.

# Hydro-Québec Production

### Orientation 1

**Ensure the steady growth of electricity sales on wholesale markets and of generating facilities in Québec**

The growth of accessible and profitable electricity markets in Québec and throughout the northeastern part of the continent encourages Hydro-Québec Production to continue developing its generating capability, with particular emphasis on the development of Québec's hydroelectric potential. Over the 2002–2006 period, Hydro-Québec Production aims to achieve annualized sales in excess of $7 billion, thanks to an increase of at least 12 TWh in annual generating capability.

All projects will have to meet the following three conditions:

- be profitable under market conditions
- be environmentally acceptable
- be well received by local communities

Aware of hydropower's economic and environmental advantages, Hydro-Québec Production will continue to develop hydroelectric potential in and around Québec. Over the Strategic Plan period, the division plans to invest $1,700 million in hydroelectric projects.

Hydroelectricity has many benefits and remains the option of choice, but it also has certain disadvantages, including longer time frames, especially for major facilities. Consequently, Hydro-Québec Production plans to initiate and carry out a number of significant, carefully selected thermal generation projects. Investments in this area are expected to reach $550 million over the term of the Strategic Plan.

In addition, Hydro-Québec Production intends to purchase electricity under market conditions, from private producers and renewable sources in particular. The division will also pursue its trading and related activities, and seize international business opportunities with strong potential for profitability.

Orientation 2

**Achieve a significant increase in the division's profitability**

Thanks to increased sales, Hydro-Québec Production is also aiming for substantial growth in net income over the term of the Strategic Plan. In particular, the division plans even tighter control of expenses, combined with careful management of business risks associated with fluctuations in runoff and the marketing of electricity.

Orientation 3

**Ensure the reliability and quality of operations and promote technological innovation**

To achieve its profitability and management objectives, Hydro-Québec Production must also maintain best practices in the area of reliability and continue its technological innovation efforts to enhance the performance of generating facilities.

## Hydro-Québec Ingénierie, approvisionnement et construction

Orientation 1

**Improve the management of shared services offered to Hydro-Québec divisions**

Hydro-Québec Ingénierie, approvisionnement et construction—the division responsible for engineering, procurement and construction—intends to optimize the management of the shared services it provides to other Hydro-Québec divisions. It will do so by reducing its own costs and improving processes used by client divisions, especially with regard to procurement and services.

Hydro-Québec Ingénierie, approvisionnement et construction will participate in projects involving the refurbishment of generating stations, reinforcement of the transmission system, and development of Québec's hydroelectric potential. As projects are carried out, the division will promote environmental protection, reduce construction lead times, and work to ensure that projects are well received by local communities.

**Orientation 2**

## Promote engineering and construction know-how in power generation and transmission

Hydro-Québec Ingénierie, approvisionnement et construction plans to focus its international operations on the Americas and to develop the most promising market niches in areas where it has a high level of expertise:

- rehabilitation and optimization of hydroelectric generating stations in the United States
- installation of optical fibres on live power lines
- installation of power grid control systems
- engineering and construction of interconnections in South America

# Financial and Economic Outlook

While consolidating the progress made in terms of service quality over the past several years, the orientations of the *Strategic Plan 2002–2006* will lead to an improvement in the company's financial position. Return on equity should remain stable over the rate freeze period, and then start rising gradually as of 2004.

By 2006, net income should rise from $1,025 million to $1,600 million, mainly on the strength of higher sales in Québec. Sales volume for all markets in the province will increase by about 1.6% per year over the 2001–2006 period.

Based on the forecast consolidated results, the shareholder can expect to receive $3.2 billion in dividend payments over five years, in accordance with Hydro-Québec's dividend policy. In addition, Hydro-Québec will pay some $3.3 billion in taxes to the Québec government and municipalities, as well as $0.9 billion in loan guarantee fees.

Hydro-Québec also makes a significant contribution to Québec's economy through its growth, capital spending and purchases of goods and services.

Over the 2002–2006 period, Hydro-Québec's activities will help sustain 183,000 person-years of employment in all regions of Québec.

# Introduction

## Background

Hydro-Québec has been supplying reliable power to Quebecers and contributing to the province's prosperity for over 50 years.

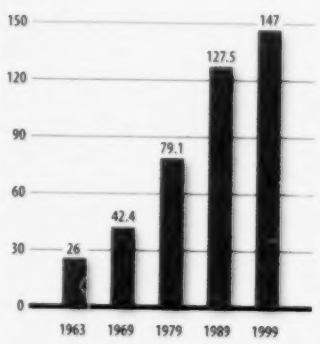
In 1944, the Québec government acquired Montreal Light, Heat and Power Consolidated for the specially created Québec Hydro-Electric Commission. This marked the beginning of Hydro-Québec. Serving customers mainly in the Montréal area, the new entity inherited four hydroelectric generating stations: Chambly, Rivière-des-Prairies, Les Cèdres and Beauharnois.

Soon after the company was created, the post-war boom, with its attendant population explosion and strong industrial growth, triggered urban sprawl and the growing popularity of household appliances. Electricity demand intensified and accelerated toward the end of the 1950s. To meet its customers' growing needs, Hydro-Québec had to undertake new development projects to boost its generating capability.

In the late 1950s, Hydro-Québec joined forces with Québec engineering firms to begin construction of the Manic-Outardes complex. This partnership, which continued for decades, allowed Québec engineers to gain international prominence in the field of high-voltage transmission and hydroelectric generation.

In the early 1960s, Quebecers did not all have equal access to electricity. While Hydro-Québec's Montréal customers enjoyed favorable rates, consumers in many outlying regions were faced with excessively high prices. In 1962, to put an end to this disparity, the Québec government announced its intention to nationalize the electricity industry and bring it under the control of Hydro-Québec.

***Electricity Demand in Québec 1963–1999***[1] *(TWh)*



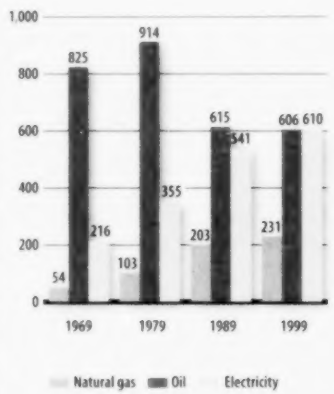

1. *The 1999 data include the impact of energy conservation programs.*

Hydro-Québec was now able to meet the needs of all Quebecers, guarantee them improved service quality, and develop Québec's exceptional hydroelectric potential.

Daniel-Johnson dam at Manic-5, inaugurated in 1968, stands as a powerful symbol. It is the world's largest arch and buttress dam; the final stages of construction were shown live during the Montréal World Fair. The dam is a source of pride for Quebecers and a testament to their ingenuity. With a capacity of 5,517 MW, the Manic-Outardes complex also ensures the availability of renewable, low-cost energy for Hydro-Québec's customers.

The completion of the Manic-Outardes complex also led to major technological innovations. For instance, Hydro-Québec was the first company in the world to transmit electricity over long distances using extra-high-voltage lines (735 kV), a solution that has since been adopted elsewhere around the globe.

***Québec's Energy Balance***
*End-Use Consumption*
*(petajoules – PJ)*




At the end of the 1960s, Hydro-Québec and Newfoundland and Labrador Hydro became partners in Churchill Falls (Labrador) Corporation (CFLCo) to develop the hydroelectric potential of the upper Churchill River in Labrador. This partnership led to the commissioning of a 5,428-MW generating station.

In the early 1970s, the Québec government launched the largest construction project in the province's history: the La Grande hydroelectric complex, located in the James Bay region. The soundness of this major investment decision became apparent a few years later, with the 1973 and 1979 oil crises. At the height of construction, more than half of all Québec construction workers were employed at the James Bay sites.

In 1975, Hydro-Québec joined the Cree and Inuit communities and other parties to sign the *James Bay and Northern Québec Agreement*, which has since served as a model for similar agreements around the world. Over the years, other agreements have been added to the original document to broaden its scope. Based on respect, understanding and the sharing of common goals, these agreements paved the way for new partnerships.

Thanks to abundant low-cost energy from the James Bay facilities, Hydro-Québec was able to meet the growing needs of Quebecers and promote the development of new industries. Gradually, electricity took on a larger role in Québec's energy balance, making the province more self-sufficient and giving it a secure supply of clean energy.

Phase I of the La Grande complex was completed in the early 1980s. The Québec National Assembly amended the *Hydro-Québec Act* to allow the company to pay an annual dividend to the government and to sell more electricity outside Québec. Later in the decade, Hydro-Québec announced the start of Phase II of the La Grande complex (4,954 MW).

The 1990s saw the startup of construction at the Sainte-Marguerite-3 hydroelectric site, the implementation of a program to enhance transmission system reliability, the deployment of an ambitious energy efficiency program, and the improvement of customer service.

In 1996, the Québec government published its Energy Policy, which aims to put energy to work for Quebecers and to respect the principles of sustainable development, while taking full advantage of the changes under way in the North American energy industry.

The Energy Policy confers an important role on Hydro-Québec and establishes a number of orientations that concern the company:

- Hydro-Québec shall remain the exclusive property of the Québec government.
- Hydro-Québec shall improve its profit margin and generate a higher return for its shareholder.
- Hydro-Québec shall be the cornerstone of an industrial strategy aimed at making Québec a major energy hub.

- Hydro-Québec shall pursue its technological innovation efforts by focusing its research and development (R&D) on its core activities, thereby emphasizing the commercial potential of its projects with a view to increasing partnership opportunities with the private sector and generating more industrial and commercial spinoffs.
- Hydro-Québec shall seek to forge a new economic partnership with Aboriginal nations, in order to develop the energy resources of northern and eastern Québec.

In 1996, the Québec government created the Régie de l'énergie du Québec (energy board), the agency that establishes the regulatory framework for energy transmission and distribution. As a result, any changes in electricity rates in Québec are subject to the Régie's approval.

On May 1, 1997, Québec joined the continent-wide move toward liberalization and opened its transmission system and wholesale electricity market to competition. A few months later, H.Q. Energy Services (U.S.), a subsidiary of Hydro-Québec, was licensed by the U.S. Federal Energy Regulatory Commission (FERC) to sell wholesale electricity at market prices. This allowed the company to conduct transactions directly in the United States under regular market conditions, further capitalizing on the major assets and commercial expertise developed over the years in Québec.

***Power Distributors in Québec***

- *Hydro-Québec*
- *9 municipal systems*
- *1 regional electricity cooperative*

The Québec wholesale electricity market comprises 11 distributors: Hydro-Québec's distribution division, nine distributors operating municipal systems, and one regional electricity cooperative. The opening of the wholesale market means that municipal systems and the regional electricity cooperative can, like Hydro-Québec Distribution, purchase electricity inside and outside the province, and independent producers in Québec can, like Hydro-Québec Production, sell their electricity outside Québec.

Because of Hydro-Québec's highly competitive electricity rates for its Québec customers, no transaction has been recorded to date involving outside producers supplying electricity directly to the Québec wholesale market, apart from Hydro-Québec Production's direct purchases from outside Québec.

Spurred by the energy convergence sweeping North American markets, Hydro-Québec acquired a 41% stake in Noverco, the holding company that controls Gaz Métropolitain, along with an option to secure an additional 9% interest. Through Noverco, it also acquired a major indirect interest in Enbridge, the world's leading oil pipeline company and the largest natural gas distributor in Canada.

Focusing on growth and profitability, the *Strategic Plan 1998–2002* announced that Québec electricity rates would be frozen until 2002. Taking inflation into account, this rate freeze now represents a reduction of almost 9% in actual rates since 1998. The *Strategic Plan 2000–2004* confirmed the rate freeze until 2002 and aimed for rate stability thereafter.

The opening of the North American market has been beneficial for Hydro-Québec. From 1997 to 2000, the company's sales rose by nearly 50%, while its net income doubled. In 2000, about 21% of its revenue was generated outside Québec. Based on these financial results, Hydro-Québec was able to contribute to the collective prosperity of Quebecers by paying almost $1 billion in dividends to the Québec government for the 1999 and 2000 fiscal years.

Following the Québec government's adoption of the *Act to amend the Act respecting the Régie de l'énergie* in 2000, the company confirmed the unbundling of its electricity distribution, generation and transmission business units.

The new Act maintains the benefits gained through nationalization of the electricity sector and makes Hydro-Québec Distribution responsible for distribution system reliability and security of the power supply for Québec consumers.

More than ever before, Hydro-Québec has the tools it needs to serve its Québec customers and consolidate profitable business operations outside Québec, thereby contributing to Quebecers' prosperity.

# Business Environment

Opening of the electricity market and the widespread use of new technologies have radically changed the power industry in recent years. Hydro-Québec has adjusted quickly to this new business environment by becoming more efficient and by playing an active role on the wholesale market.

## Situation in Québec

Since December 1996, the Régie de l'énergie has provided the regulatory framework for the distribution and transmission of electric power. Hydro-Québec's distribution and transmission activities, like those of the gas industry, are subject to a form of economic regulation based on the cost of providing service.

In order to preserve the benefits derived from nationalization, the *Act to amend the Act respecting the Régie de l'énergie* established a heritage pool giving Québec consumers access to a maximum volume of 165 TWh of electricity per year. Hydro-Québec Production must supply Hydro-Québec Distribution with generating output at an average commodity rate of 2.79 cents per kilowatthour—the lowest rate in North America for such large quantities of energy.

***A heritage pool volume of 165 TWh, at an average rate of 2.79¢ per kilowatthour***

To meet demand in excess of this 165-TWh volume, Hydro-Québec Distribution will have to conclude power supply contracts through a tendering procedure, in accordance with the Act. All interested producers, including Hydro-Québec Production, may respond to Hydro-Québec Distribution's calls for tenders.

There is virtually no market pressure for deregulation of the retail market in Québec. Given the absence of tangible benefits for its customers, Hydro-Québec does not intend to promote the opening of this market. Nevertheless, the *Act respecting the Régie de l'énergie* allows the Québec government, when it deems it appropriate, to ask the Régie de l'énergie to look into the possibility of opening up the retail market. Hydro-Québec does not expect any initiatives on this matter in the short term.

The *Act to amend the Act respecting the Régie de l'énergie* also confirms certain criteria for the setting of electricity transmission rates and the rates charged by Hydro-Québec Distribution. These criteria include uniformity throughout the power system. Furthermore, the Act guarantees that the rate for a given customer category cannot be changed in order to offset cross-subsidization among Hydro-Québec Distribution rates.

## Situation in North America

***Electricity sales outside Québec: $4 billion over a three-year period***

Hydro-Québec has been making substantial electricity sales outside Québec for many years now. During the 1980s, these sales produced annual revenue of about $500 million on average. Since the wholesale market was opened, the company achieved more than $4 billion in export sales over a three-year period. In 2000, sales outside Québec amounted to almost 21% of total sales. Changes in the North American business environment are clearly contributing to the growth in Hydro-Québec's sales.

## Situation in the United States

### *Electric Power Supply*

Since 1997, the U.S. wholesale market has been open to competition following the establishment of conditions for non-discriminatory open access to transmission systems. In this regard, the power marketer licence granted by the FERC to H.Q. Energy Services (U.S.) gives Hydro-Québec Production greater flexibility in its choice of transactions. Electricity can now be delivered on attractive terms not only at the Québec border, but also directly to American markets.

Since it was opened to competition, the U.S. wholesale market has undergone profound changes. In the northeastern states, a number of public utilities have disposed of their generating assets, thus opening the door to new players, often large ones, specializing in the generation and trade of electricity and other forms of energy—gas, coal and oil.

The opening of the wholesale market has also led to the emergence of energy traders and marketers, who handle an ever-increasing share of total sales. This is made possible by the creation of power exchanges which enable producers and resellers to participate in short-term markets via direct tenders.

***New financial instruments are used to reduce market risks***

Hydro-Québec's transactions on spot and short-term markets have risen significantly. These transactions take the form of sales and purchases in the northeastern U.S., as well as energy trading operations. New financial instruments designed to meet the growing needs of energy producers and consumers have been developed in recent years. These instruments, which Hydro-Québec uses extensively to reduce market risks, allow the company to carry out hedging and arbitrage transactions based on fluctuations in energy prices.

Generally speaking, market opening led to a decline in wholesale electricity prices until the summer of 1999. However, production reserve margins fell sharply, leading to price spikes during peak periods. Market development and the increased volume of transactions have caused prices to fluctuate considerably.

In 2000, soaring fuel prices pushed up electricity prices on all wholesale markets. However, they were only partially to blame for the energy crisis that gripped California in the summer of 2000. Power shortages and the resulting exorbitant prices were caused by a combination of factors: extreme temperatures, increased demand, low runoff, a reduction in the export capacity of neighboring systems, higher fuel prices, and inadequate adjustment of supply and demand in relation to market conditions.

Since early 2001, the decline in fuel prices has brought down electricity prices. The commissioning of new generating facilities in the United States has also contributed to this trend. Moreover, the energy situation in California improved during the summer of 2001, thanks to measures taken to stabilize the market and favorable weather conditions.

The new U.S. energy policy recommends adopting administrative and legislative measures to increase supply and reduce demand, in order to secure Americans' future energy supply, and thus their economic future.

### *Power Transmission*

In this area, the trend is toward consolidation of transmission systems into large, integrated systems managed by independent system operators (ISOs). It appears, however, that this consolidation has not fully met the FERC's expectations with respect to the development of transmission systems (especially in congested areas) and their efficient, secure and non-discriminatory management. Therefore, in 2000, the FERC issued a Notice of Proposed Rulemaking with a view to finalizing by December 15, 2001, a strategy for the creation of four regional transmission organizations (RTOs)—covering all of the United States, with the exception of Texas, whose system is asynchronous. In September 2001, Pat Wood, the new chairman of the FERC, reiterated this objective, indicating that non-regulated subsidiaries of companies that did not declare their commitment on time would lose their power marketer licences.

*In the United States, four regional transmission organizations could be created*

A number of public utilities have submitted proposals to the FERC for the creation of RTOs: non-profit ISOs, for-profit TransCos (companies specializing in power transmission), or a combination of both.

TransÉnergie, which operates Hydro-Québec's transmission system, does in fact have the features of an RTO:

- exclusive management of the reliability and security of Québec's asynchronous system, as well as facility operations;
- its load (33,000 MW) and geographic reach;
- uniform rates throughout the system;
- independent management ensured by the unbundling of TransÉnergie's operations vis-à-vis Hydro-Québec Production's generation and wholesale operations.

***Building merchant lines to reduce congestion on transmission systems***

The independent power transmission market is also growing rapidly in the United States; in particular, it has become possible to build merchant lines to reduce congestion on transmission systems. At various locations, mostly in the Northeast and Midwest, the price differential between two adjacent markets can justify the cost of building a transmission line. According to the merchant line concept, transmission rates are based on the difference in energy prices between interconnected systems, rather than on a fixed return. Hydro-Québec participated in the construction and operation of the DirectLink line in Australia, the world's first merchant line. Moreover, TransÉnergie U.S. has received FERC authorization to sell wheel-through capacity on the line that it will build between Long Island, N.Y., and Connecticut, when it obtains the necessary permits.

### *Retail Market*

In the United States, the decision to open the retail market rests with each state, although certain federal legislative initiatives reflect an intention to encourage a more uniform time frame for opening markets across the country. However, the restructuring of retail markets is turning out to be much slower than expected.

A number of states are hesitant to open their retail markets largely because of the impact of California's energy crisis on consumer confidence.

In states where the retail market has already been opened, such as Pennsylvania, Maryland and most New England states, restructuring has been a relative failure so far, due mainly to high wholesale prices. In fact, very few customers have changed their power supplier. California and Rhode Island are even planning to take a step backward by closing their retail electricity markets. Furthermore, 23 states have joined forces to claim the right to keep their retail markets closed.

***North America***
***Average Price of Electricity by State and Province (USȼ/kWh)***
*(overall average in 1999)*

*Source: Energy Information Administration, Statistics Canada*

## Situation in Canada

Although a major restructuring process is already under way in Canada, the opening of electricity markets remains limited in most provinces.

Apart from Québec, only British Columbia and Alberta have opened up their wholesale markets to competition. On the retail side, Alberta is the only province that has opened its market, and it has done so only partially.

In Ontario, the review and consultation processes initiated in 1995 on the future of the electricity industry have led the government to embark on a major market restructuring. In 1999, Ontario Hydro was split into three separate entities, all having the provincial government as their sole shareholder: a generation entity; an electricity services entity which handles transmission and distribution in rural areas; and an entity responsible for the independent management of the system as well as the power exchange. The opening of the wholesale and retail markets, which was delayed, is now slated for May 2002.

***H.Q. Energy Marketing may trade on the Ontario market***

Once the Ontario market opens up as planned, Hydro-Québec should be able to make off-peak purchases. H.Q. Energy Marketing, a subsidiary controlled by Hydro-Québec Production, has obtained a licence from the Ontario Energy Board allowing it to trade on the Ontario electricity market when it has opened up.

The major restructuring in Ontario is mainly in response to problems associated with the operation of nuclear power facilities in the 1990s. However, as in the United States, stranded costs are expected to diminish the beneficial effects of market opening for consumers.

In New Brunswick, the transmission system is open to third parties for certain transactions. Hence, the province's independent producers can use New Brunswick Power's transmission system to wheel-out electricity for export purposes. However, the province has not yet established non-discriminatory open access conditions allowing external suppliers to use the system to wheel-through energy to customers outside New Brunswick. The province's new energy policy is designed to create a more competitive energy market, while guaranteeing a safe, reliable and low-cost power supply. Under this policy, the wholesale and retail markets for large industrial users are expected to be opened in 2003. Further opening of the retail market will be reassessed every two years.

## International Situation

By 2010, it is estimated that nearly 800,000 new megawatts will be needed to meet growing electricity demand worldwide. Over half of this growth will be driven by energy requirements in Asian countries.

***By 2005, an estimated $150 billion will be invested in hydropower projects***

In most of these countries, the absence or inadequacy of energy infrastructure often constitutes one of the biggest roadblocks to economic growth. New energy demand is expected to give rise to investments in power generation and transmission facilities worth about $1,300 billion between now and 2010.

By 2005, an estimated $150 billion in capital investments will be needed to implement hydroelectric projects that will help meet growing demand, primarily in Asia and South America.

Access to capital and know-how is a major hurdle for many countries experiencing rapid economic and population growth. To accelerate their development, these countries are therefore inviting companies active on the international scene to invest in their energy infrastructure.

Around the world, there are numerous business opportunities in electricity generation and transmission, as well as engineering and construction. However, the competition on this global market has intensified. Companies that succeed are those that focus on sectors where they can use their world-class expertise to manage and control risks more effectively than their competitors.

With this in mind, Hydro-Québec will focus its international activities on high-voltage transmission and the management of hydroelectric generation, areas in which the company excels.

# Energy Working for Québec

## Hydro-Québec's Mission

**"The objects of the Corporation are to supply power and to pursue endeavours in energy-related research and promotion, energy conversion and conservation, and any field connected with or related to power or energy."**
*(Hydro-Québec Act)*

*Orientations designed to consolidate the progress already made*

## Staying the Course

The orientations proposed in Hydro-Québec's *Strategic Plan 2002–2006* follow from those of the previous Strategic Plan. Appendix 1 provides a summary of the activities and results of the *Strategic Plan 2000–2004*. The company's orientations are meant to consolidate the progress made with respect to the major goals set forth in the *Hydro-Québec Act* and the Québec Energy Policy:

- Supply high-quality electric power to all Québec customers.
- Manage its activities so as to create value for the shareholder.

Hydro-Québec has many advantages that will help it to achieve these objectives:

- improved customer service
- hydroelectric potential that can be developed at competitive costs
- favorable locations for thermal generation projects

- marketing and price arbitraging potential on wholesale markets in the U.S. Northeast, based on hydroelectric generating stations, reservoirs and interconnections
- the expertise to gain prominence on international markets in the fields of high-voltage transmission and hydroelectric facilities with energy trading potential
- the necessary know-how to develop attractive business niches in engineering and construction
- a presence in the development of energy transmission and natural gas distribution, through its interest in Noverco

Building on its strengths, Hydro-Québec will concentrate on improving overall performance in terms of five key issues:

- quality of customer service
- employee motivation and expertise
- creating value for the shareholder and Québec society
- technological innovation
- efficiency and synergy of activities

## Improving Hydro-Québec's Overall Performance

*The largest energy company in Québec*

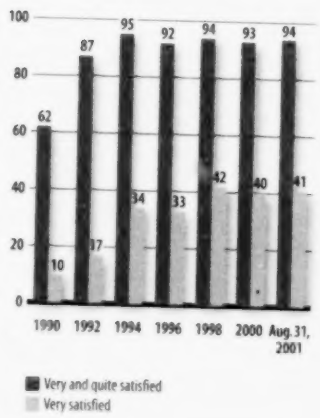
Given the value of its assets and the scope of its activities, Hydro-Québec is the largest energy company in Québec. Therefore, it is important to ensure that the company continues to grow and create new wealth for Québec society. While continuing to support the province's economy, Hydro-Québec must ensure that its customers receive the best possible service for their money. It must also ensure that its employees are motivated, productive and satisfied with their jobs, and that the shareholder obtains a maximum rate of return.

## Quality of Customer Service

The actions arising out of the *Strategic Plan 2000–2004* allowed Hydro-Québec to achieve very positive results in terms of service to Québec customers. For example, the rate of public satisfaction with Hydro-Québec's activities stood at 93% in 2000. This reflects the general image that the public has of the company's management and service performance. The improvement in public satisfaction continued in 2001, with an overall rate of 94%, including 41% who were "very satisfied."

To serve its customers well, Hydro-Québec is committed to consolidating the improvements it has made to service quality. With respect to rates, the company has taken note of the Québec government's request not to increase rates for 2002 and 2003. However, it must consider raising rates as of 2004, in order to generate a normal return in a regulated environment.

***Rate of Public Satisfaction*** *(%)*




## Employee Motivation and Expertise

Hydro-Québec's performance depends, above all, on its people, whose know-how and efficiency are key to the company's growth and profitability.

Like most North American companies, Hydro-Québec must come to terms with the aging of a large segment of its work force. By 2012, more than half of its employees will be eligible for retirement. Furthermore, the company faces new challenges that call for new skills. Hydro-Québec plans to deploy a new corporate succession plan designed to ensure the appropriate level of expertise and proactive skills management. The company is intent not only on renewing its work force, with priority given to strategic and vulnerable jobs, but also on stepping up its efforts to recruit people with the appropriate new skills. In this regard, Hydro-Québec will strive to be perceived and sought after as a highly desirable employer in an increasingly competitive market. As well, the corporate succession support plan calls for the implementation of efficient management methods that focus specifically on knowledge maintenance and transfer, in order to ensure the continuity of know-how.

***By 2012, over half of all employees will be eligible for retirement***

Hydro-Québec will continue its efforts to motivate its employees. Without their commitment, the company's strategic orientations and the strategies of each division would be impossible to implement. The large-scale deployment of employee learning tools related to the company's business has greatly improved their understanding of the role they play in helping the company achieve its objectives. Through their work—be it in customer service, technological innovation, system maintenance or development projects—all employees contribute to the organization's overall performance. The communication effort will be continued and strengthened, with a view to sustaining employees' commitment. Similarly, discussions with employee representatives will be intensified to solicit their participation in the motivation campaign.

Moreover, the major changes in the electricity industry, the increased use of technology in the workplace, and customer expectations of more tailored service call for better work organization. More flexible management of schedules and modern rules of internal mobility, staffing and on-the-job training will have to be implemented, in cooperation with employee representatives. This will foster a business culture based on employee empowerment—strengthening motivation and improving productivity, for the benefit of all. A first milestone for all employees has been the linkage, since 1999, of a portion of their compensation to the company's performance.

## Creating Value for the Shareholder and Québec Society

The actions stemming from the *Strategic Plan 2000–2004* have helped improve the company's profitability. In 2000, Hydro-Québec's net income exceeded one billion dollars. Pursuing its profitability and value creation objectives, Hydro-Québec will continue to develop its generating facilities and electricity sales on the retail market in Québec as well as on wholesale markets.

Nevertheless, the company's return on equity was only 7.7% in 2000. This result is mainly due to Hydro-Québec Distribution's shortfall, as compared with a normal return in a regulated environment.

While gradually improving its financial position, the company will help support economic development and employment in all regions of Québec through its operations; investments in power generation, transmission and distribution; and purchases from independent power producers, as well as the activities of its technological subsidiaries and its international projects.

Hydro-Québec will also participate in the diversification of the Québec economy. Its industrial business development efforts will target value-added sectors, with a view to creating maximum wealth and jobs in Québec for each megawatt of new industrial demand.

## Technological Innovation

The technological quality of Hydro-Québec's facilities, activities, products and services has always been a source of pride, growth and profitability for the company and the electricity industry. Hydro-Québec intends to maintain its leadership in technology and to increase the benefits derived therefrom. In 2000, the company invested slightly over $100 million in technological innovation, making it the Canadian leader among electricity companies and the fifteenth-ranked company overall. Therefore, technological innovation is one of the key means that Hydro-Québec will use to improve its overall performance.

*In 2000, Hydro-Québec invested over $100 million in technological innovation*

The efficiency of Québec's electrical system as a whole—from production to consumption—is already substantial. Extra-high-voltage transmission, for example, helps keep energy losses at a minimum. In addition, hydroelectricity, which is the leading energy source in terms of efficiency, has been highly instrumental in improving Québec's energy efficiency. In order to continue improving Hydro-Québec's energy performance, a large portion of its technological innovation activities will concern the generation, transmission and distribution of high-quality power, at the lowest cost and as efficiently as possible.

In 2000, Hydro-Québec instituted integrated innovation management which allows all players—researchers, users, development specialists and external partners—to interact throughout the process, bringing their expertise to bear on each phase of a project.

Hydro-Québec will consolidate its proactive management of technological innovation, redefined according to the following criteria:

- integrated management, an approach that relates all aspects of an innovation to its eventual use in the power system and on customer premises, combined with commercialization where appropriate;
- research with a renewed focus on core activities, built around strategic themes that support the growth of such activities;
- modern research management focusing on its world-renowned expertise and areas of excellence, and open to partnerships;
- projects chosen based on their economic value at the time they are implemented within the company;
- portfolios made up of major projects with significance for the company, balancing short-, medium- and long-term needs;
- market intelligence conducted through profitable venture-capital investments, making it easier to identify emerging technologies associated with the company's core activities and expanding knowledge of the energy sector's technological market;
- commercialization of technologies developed by Hydro-Québec which are marketable abroad;
- long-term vision, allowing the company to prepare for foreseeable future breakthroughs and thus ensure its long-term viability.

A more detailed presentation of Hydro-Québec's management of technological innovation can be found in Appendix 2.

## Efficiency and Synergy of Activities

The new regulatory environment in North America has obliged most vertically integrated electricity companies to restructure their activities according to operating segment: generation, transmission and distribution. This specialization allows transmission and distribution organizations to offer producers, and other suppliers and customers, nondiscriminatory open access to their regulated systems.

After creating the TransÉnergie division in 1997 to respect the rules governing the North American wholesale market, Hydro-Québec created three new divisions in 2001: Hydro-Québec Distribution, Hydro-Québec Production and Hydro-Québec Ingénierie, approvisionnement et construction.

The chart opposite shows the breakdown of Hydro-Québec's $10.4 billion of revenue from the electricity sector in 2000, as it would have been distributed among Hydro-Québec Distribution, TransÉnergie and Hydro-Québec Production. The *Strategic Plan 2002–2006* reflects this new structure and presents orientations and development strategies for each division.

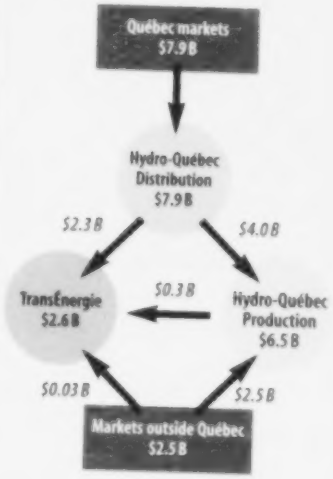
Hydro-Québec Distribution was created to guarantee equal treatment to all producers in open bidding for future power supply contracts, to meet requirements that exceed the heritage pool volume. Since its inception in 1997, TransÉnergie has ensured that all wholesale customers have nondiscriminatory open access to Québec's transmission system, thus complying with regulatory provisions in the United States.

Furthermore, the divisions, which are vested with mandates and responsibilities in their particular lines of business, will be better poised to seize new growth opportunities within their respective market niches.

Ambitious targets have been set for each division and progress in achieving them will be evaluated by specific indicators. Ultimately, the company's overall performance will depend on rigorous management that holds each division accountable for optimizing its own processes and business objectives.

Hydro-Québec will ensure that the divisions' objectives are in line with the expectations of its customers, its shareholder and its work force. Like any commercial enterprise, the company must strive to keep major risks in balance, allocate capital, apply effective financial controls, minimize financial expenses, manage talent, and develop leadership among its management staff.

***Revenue Flow Among the Divisions*** *(2000)*[1]




1. *Excluding revenue from the natural gas segment, Hydro-Québec Ingénierie, approvisionnement et construction and the company's service units (total consolidated Hydro-Québec revenue: $11.4 B)*

***Revenue for each division—electricity segment ($10.4 B)***

- *Hydro-Québec Distribution: $1.6 B*
- *TransÉnergie: $2.6 B*
- *Hydro-Québec Production: $6.2 B*

*$ B: billions of dollars*

## Orientations of the *Strategic Plan 2002–2006*

An analysis of Hydro-Québec's major strategic issues led to the formulation of these orientations:

### Hydro-Québec Distribution

**Serve Québec customers well**

**Improve the division's profitability**

### TransÉnergie

**Offer customers value-added transmission service**

**Maintain the reliability and integrity of the system operated by TransÉnergie, the only regional transmission organization in Québec**

**Ensure the division's profitability, in particular by seizing international business opportunities**

**Ensure the steady growth of electricity sales on wholesale markets and of generating facilities in Québec**

**Achieve a significant increase in the division's profitability**

**Ensure the reliability and quality of operations and promote technological innovation**

### Hydro-Québec Ingénierie, approvisionnement et construction

**Improve the management of shared services offered to Hydro-Québec divisions**

**Promote engineering and construction know-how in power generation and transmission**

# Hydro-Québec Distribution

**Fixed assets as at Dec. 31, 2000**
$7.9 billion

**Revenue in 2000**
$7.9 billion

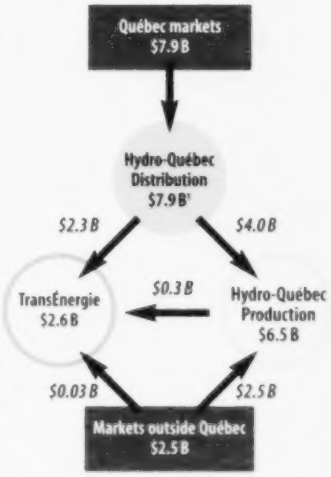
**Main customers in 2000 (% of revenue)**
Markets subject to the Rates Bylaw: 92.2%
Individual contracts: 7.2%
Unregulated: 0.6%

**Number of employees as at Dec. 31, 2000**
7,376

**Regulatory regime**
Cost-based

# Hydro-Québec Distribution

***Revenue Flow Among the Divisions—Electricity Segment*** *(2000)*




*1. Revenue specific to this division: $1.6 B*

*$ B: billions of dollars*

## Mandates

- **Provide reliable and continuous electricity service to Québec customers**
- **Ensure a secure supply of electricity**
- **Offer services adapted to customers' priority expectations**

## Orientations for 2002–2006

**1 Serve Québec customers well**

**2 Improve the division's profitability**

Orientation 1

Serve Québec customers well

## Strategy 1.1

## Consolidate the gains made in terms of service quality in Québec

The performance of Hydro-Québec Distribution has improved substantially since the last Strategic Plan in terms of service interruption duration and customer service, particularly as regards rapid response to customers who contact the Hydro*Direct* call centres. The efforts made to meet customers' expectations and needs have translated into greater customer satisfaction.

In order to continuously improve service and business practices, Hydro-Québec has, since the early 1990s, periodically measured the expectations of its different customer categories. The basic expectations are the same for all customer categories, but with degrees of importance and other slight variations that reflect their individual situations.

***Customers' Priority Expectations***

| **Business relations** | **Power supply** |
|---|---|
| - Fair and equitable treatment | - Safe facilities |
| - Respect for customers and understanding of their needs | - Rapid repair of power failures |
| - Low, competitive rates | - Advance notification and consultation on scheduled interruptions for system maintenance |
| - Simple, optimal rate structure | - Reduction of power failures |
| - Rapid, clear and courteous telephone response | - Fast and accurate information in the event of a power outage |
| - Speedy processing of requests and follow-up | - Adequate supply for the future |
| - Reliable means of measuring consumption | - Respect for property during work |
| - Accurate, simple billing based on actual consumption | |

Hydro-Québec Distribution plans to consolidate its gains in the area of customer service so as to offer more consistent quality in a context where customer expectations have grown, based on the performance of other public service companies.

Three major means are planned to support this strategy:

- Offer reliable electricity service.
- Offer products and services adapted to customer needs.
- Act as a socially and environmentally responsible distributor.

*Satisfaction levels of between 7.5 and 8.0 out of 10, according to the major customer categories*

Any improvement involving additional costs must be submitted to the Régie de l'énergie in order for the company to be able to recover these costs through rate increases.[1]

Over the Strategic Plan period, the division's objective is to achieve and maintain a level of customer satisfaction ranging between 7.5 and 8.0 out of 10, depending on the customer category.

### *Provide reliable electricity service*

Hydro-Québec Distribution is still committed to improving service continuity. The division is aiming for a service average interruption duration index (SAIDI) of 2.35 hours per customer for 2004, 2005 and 2006, representing 1.7 hours for the distribution system and 0.65 hours for the transmission system.

In the densely populated area of downtown Montréal, Hydro-Québec Distribution is maintaining its SAIDI target of 1.3 hours as of 2004. For densely populated areas in other large cities, the target will be between 1.3 and 1.65, depending on the performance of the transmission system.

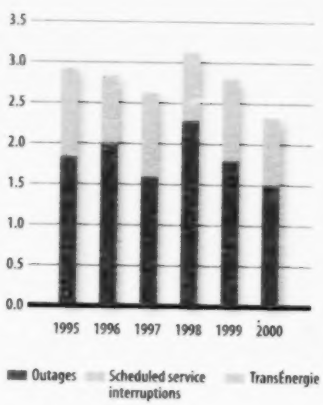
1. Costs incurred as of 2002 can technically be recovered through the approval of deferred charges by the Régie de l'énergie.

To guarantee such reliability at the lowest possible cost, Hydro-Québec Distribution is continuing to implement preventive maintenance practices and automation measures designed to improve or consolidate system performance on a sustainable basis. The division will pay particular attention to customers exposed to interruptions that far exceed the Québec average and those who are very sensitive to service interruptions.

Hydro-Québec Distribution is continuing to take action to reduce the risks associated with exceptional weather events. The program to reinforce the distribution system in all areas with a high risk of icing will end in 2004. As a result, the majority of customers could have their power restored in less than a week if an event similar to that of January 1998 were to occur.

Hydro-Québec Distribution will continue to improve its procedures for intervening in the event of a blackout through its Service Restoration Emergency Plan (SREP). The division is partnering with municipalities to establish methods for dealing with major weather events.

***Average Hours of Service Interruption per Customer*** [1]




1. *Not including interruptions related to exceptional weather events.*

## *Offer products and services adapted to customer needs*

Hydro-Québec Distribution plans to consolidate its customer service improvements in order to satisfy the priority expectations of its different customer categories with high-quality offerings.

To serve customers better, Hydro-Québec Distribution has set up Hydro*Direct* call centres using leading-edge technologies for more efficient reception and handling of customer requests. The division will continue its efforts to respond more quickly to customers who contact Hydro*Direct*, with a goal of responding to 70% of calls received in 20 seconds or less.

Apart from rapid response, customers also want fast and efficient handling of their requests. Hydro-Québec Distribution is committed, therefore, to continue making the necessary efforts to ensure that customer requests are dealt with on the first call.

*Rapid access and efficient handling of requests*

**For residential customers and small businesses**
*(52% of sales revenue)*

Hydro-Québec Distribution plans to commit to specific dates or a standard lead time for priority work on customers' premises, such as hookups. The division will also provide reliable and accurate information during power failures and will notify customers of scheduled outages within time frames established according to the impact of the work on customer activities.

*Products that offer comfort and peace of mind*

Since the end of 2000, Hydro-Québec Distribution's residential customers have been able to receive and pay their bills via the Internet. Access to Hydro-Québec's Web site will be facilitated through new links with major portals, and interactive services will be expanded through new tools designed to facilitate users' understanding of electricity consumption. In addition, the integration of customer communication interfaces will be redesigned for better business relations.

Recognizing the specific needs of small businesses, Hydro-Québec Distribution has set up a special telephone line to give these customers access to specialized advisors.

At the request of customers, who recognize the quality of the division's services and its expertise in energy efficiency, Hydro-Québec Distribution is expanding its line of electrical products through its HydroSolution subsidiary. This subsidiary, which until recently was limited to the leasing and sale of water heaters, now plans to sell and install different types of heating, dual-energy and air-conditioning systems. Hydro-Québec Distribution's plans to meet some of its customers' heating, air-conditioning and ventilation needs, for their further comfort and peace of mind, constitute a direct response to the confidence they have shown.

**For institutions and medium-sized businesses**
*(20% of sales revenue)*

*Personalized advice and account management support*

Significant efforts have been made over the past two years to rethink the offerings for medium-sized companies—a very important customer category for Hydro-Québec and a driving force in the Québec economy as a whole. The goal is to provide service that is flexible and personalized enough to meet the highly diversified needs of these customers.

Customers in this category will have access to decentralized customer service, available in all regions. Those with multiple sites will be able to consult a designated representative. In addition, an aggregated billing service will be offered to customers for whom this constitutes an advantage. This service may be offered, in some cases, through remote meter-reading facilities.

Because this customer group can be severely affected by outages, the division will work to provide information rapidly during power failures and in some cases may contact the customer to arrange mutually acceptable times and dates for scheduled interruptions.

Hydro-Québec Distribution plans to reinforce its role as an advisor to these customers by developing tailored consulting services to help them with consumption management, provide information on more efficient use of electricity, and help resolve problems related to power quality.

**For large-power customers** *(28% of sales revenue)*

*An approach based on partnership*

Through high-quality service and partnerships, Hydro-Québec Distribution is responding better to the needs of large-power customers. As a result, their satisfaction with power quality and service is quite high. Over the next few years, the division will continue to offer courteous and personalized service to large-power customers.

As for the operation of the power system, the division will continue to address customers' concerns about voltage fluctuations and will take the necessary action to correct critical situations.

### *Act as a socially and environmentally responsible distributor*

Serving Quebecers well does not only mean providing reliable electricity and high-quality customer service. Hydro-Québec Distribution is also a citizen with facilities and activities throughout Québec, and as such it must fully assume its social and environmental responsibilities.

#### Offer equitable and sustainable solutions to help low-income customers

Recognizing that electricity is essential for all Québec households, Hydro-Québec Distribution is concerned about the difficulties that low-income customers face in paying their bills. As a result, for the past few years, it has been examining different approaches with community organizations and the Québec government to help customers with serious payment difficulties, while maintaining its goal of fairness toward all customers.

The results of recent experiments have shed more light on the characteristics and needs of customers with payment difficulties. Consequently, the division has revised some of its business practices, primarily those pertaining to payment agreements, to better reflect the financial situation of certain customers. Hydro-Québec Distribution will continue its search for sustainable solutions in cooperation with community stakeholders and the Québec government, in order to help low-income customers.

#### Promote the public safety awareness program

Over the past decade, many actions have been taken to reduce the number of deaths by electrocution. Since the goal is to completely eliminate such deaths, the division will continue its public safety awareness program.

In addition, Hydro-Québec Distribution will continue to promote the observance of safety rules by people working near its facilities. The division will also continue to remind its contractors of its safety requirements, as it does for its own employees.

**Fully assume its environmental responsibilities**

Hydro-Québec Distribution will do everything necessary to maintain ISO 14001 certification of its distribution system operations, thereby assuring the public of its sound environmental practices, including its respect for property during repair work and control of pollution risks.

An ISO 14001 environmental management system will also be set up by 2003 for all other activities, such as metering, meter reading, and bill printing and mailing.

Hydro-Québec Distribution is continuing its R&D efforts in environmental protection, with a view to improving its overall performance. The division will develop ways to better integrate its system into the environment, such as undergrounding its lines and designing more attractive facilities.

**Work toward system undergrounding**

Hydro-Québec Distribution will continue to work toward the undergrounding of its system through its participation in the Québec government program for distribution cable undergrounding at heritage, cultural and tourist sites. As an agent of the Québec government, Hydro-Québec Distribution will be responsible for program implementation and will spend up to $200 million over four years to cover all the costs of undergrounding its system at selected sites.

As the system is extended into new residential areas, Hydro-Québec Distribution will explain the advantages of the underground option to municipalities, developers and customers.

System undergrounding requires efforts not only by Hydro-Québec Distribution but also by the government, municipalities, and telephone and cable companies. All projects generating additional costs will be submitted to the Régie to authorize eventual cost recovery through rate increases.

Hydro-Québec Distribution aims to be a driving force in improving undergrounding practices and reducing costs. It will continue collaborating with municipalities, as well as telecommunications and energy companies, in order to standardize and optimize undergrounding practices. Examples include guidelines on joint-use trenches (CERIU, Gaz Métropolitain, Bell Canada, Vidéotron, Hydro-Québec) and cadastral survey boundaries (union of municipalities, Hydro-Québec, Bell Canada), slated for publication at the end of 2001.

## Strategy 1.2
## Supply power to Québec customers

From 1986 to 2001, electricity demand in Québec rose by an average of 2.7% a year, due to robust demand in the industrial sector, moderated by the development of energy conservation programs.

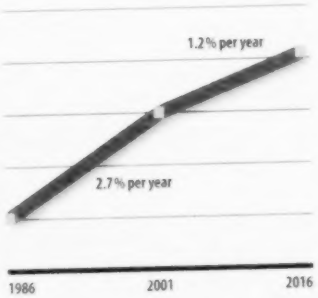
### *Growth in demand in Québec*

Over the next 15 years, electricity demand in Québec should grow by an average of 1.2% per year. This moderate rate of increase reflects the slowdown in population growth and the progress of a post-industrial economy that is more energy-efficient, more diversified and largely composed of new-economy businesses.

In 2006, electricity demand in Québec could reach 167.2 TWh, which is 1.2 TWh less than forecast in the *Strategic Plan 2000–2004*. This demand will generate revenue of $9,077 million, assuming inflation-indexed rate increases as of May 2004. Compared with 2001, these sales represent an increase of 13.0 TWh or 8.4%, with revenue up $1,160 million or 14.7%.

The forecast for electricity demand in Québec until 2006 corresponds to an average-growth scenario after energy conservation. It takes into account the economic slowdown that started in 2001 and whose ultimate scope is hard to estimate. Adding to the uncertainty are the recent terrorist attacks in the United States and their impact on the North American economy.

***Growth in Demand in Québec***
*(1986–2016)*



***Forecast of Electricity Demand and Revenue in Québec by Sector*[1] *(TWh)***

| | 2001[2] | 2002 | 2003 | 2004 | 2005 | 2006 | Growth 2001–2006 |
|---|---|---|---|---|---|---|---|
| Domestic and farm | 52.2 | 52.9 | 53.3 | 54.0 | 54.3 | 54.7 | 2.5 |
| General and institutional | 30.8 | 31.0 | 31.3 | 31.9 | 32.2 | 32.5 | 1.8 |
| Industrial | 66.6 | 68.1 | 71.0 | 73.3 | 74.3 | 75.4 | 8.8 |
| Other | 4.7 | 4.7 | 4.7 | 4.6 | 4.7 | 4.7 | 0.0 |
| **Total sales in Québec** | **154.2** | **156.7** | **160.2** | **163.8** | **165.5** | **167.2** | **13.0** |
| **Revenue in Québec ($M)** | **7,917** | **8,084** | **8,357** | **8,626** | **8,826** | **9,077** | **1,160** |
| Small and medium power | 90.3 | 91.7 | 92.7 | 94.2 | 95.0 | 95.9 | 5.6 |
| Large-power companies | 64.0 | 65.0 | 67.6 | 69.6 | 70.5 | 71.4 | 7.4 |

1. *Updated in August 2001 (including the published results for January to August 2001).*
2. *Actual temperatures for 8 months. At normal temperatures, sales for 2001 would be 0.4 TWh higher.*

On Québec small- and medium-power markets (rates D, G and M), Hydro-Québec Distribution expects to record annual sales of 95.9 TWh in 2006, 5.6 TWh more than in 2001, representing an increase of over 6%.

The growth in sales in the domestic and farm sector (2.5 TWh) stems mainly from the creation of new households, the increase in personal disposable income, and a stable market share for electricity in space and water heating.

In the general and institutional sector, the 1.8-TWh increase can be explained in the short term by the recovery of new construction stemming from the drop in vacancy rates for commercial spaces. Over the medium term, it is based on population growth and the resulting service needs, the growth of the tertiary sector, which is stimulated by the knowledge economy, and the increase in personal disposable income.

The growth in sales in the small- and medium-business sector stands at 1.4 TWh. In the short term, these sales will suffer the effects of a slowing economy. However, over the medium term, they will increase, mainly due to the expansion of existing companies, the arrival of new businesses, and the rollout of electrotechnology implementation services.

On Québec's large-power market, Hydro-Québec Distribution plans to generate sales of 71.4 TWh in 2006, 7.4 TWh more than in 2001, up by nearly 12%.

Two major industrial sectors account for over 80% of this growth:

- pulp and paper, with the transfer to Hydro-Québec Distribution of three mills that were formerly powered by Alcan's system, as well as investment projects to increase production capacity
- smelting and refining, with Alcan's new aluminum smelter in Alma, the new Magnola magnesium plant, and increased production of titanium dioxide

The growth of the other sectors is dependent on the economic recovery, which is expected to begin in 2002. This should send production levels back upward, notably in the metals and mining sectors, which are seriously affected by the current slowdown.

Moreover, in all of Hydro-Québec Distribution's markets, growth in sales is strongly sustained by the competitive position of electricity, fostered by the stability of electricity rates and the increase in price of other forms of energy.

### *Prepare supply plans*

Under the *Act to amend the Act respecting the Régie de l'énergie*, the maximum amount of heritage pool electricity has been set at 165 TWh per year. New rules are set out in the act to provide for demand beyond this volume, which will have to be met through a bidding process. All interested producers may tender, including Hydro-Québec Production.

In July 2001, the Régie de l'énergie approved Hydro-Québec Distribution's proposed code of ethics governing bid management as well as tendering and contract award procedures.

Off-grid systems will continue to be powered by Hydro-Québec Distribution, which owns the generating facilities serving these systems.

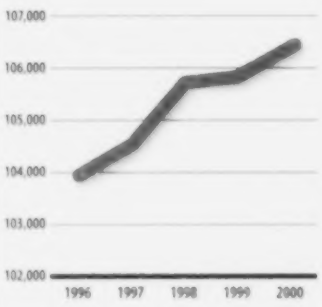
The division plans to implement the following measures to guarantee a reliable power supply for Quebecers:

- Develop supply and follow-up plans and submit them to the Régie de l'énergie, taking into account Quebecers' needs, energy savings, demand fluctuations, the need for security of supply, and the specific characteristics of off-grid systems. In the fall of 2001, the first Electricity Supply Plan will be submitted to the Régie for approval.
- Issue calls for tenders resulting from the supply and follow-up plans; long-term calls for tenders may be issued every year, according to need. The first of these calls for tenders will be issued in 2002 and will be aimed at satisfying Quebecers' needs beyond the heritage pool in the 2006–2007 period. In addition, Hydro-Québec Distribution will, at the appropriate time, issue short-term calls for tenders dictated by the need to manage fluctuating demand.
- Submit supply contracts for approval in accordance with the Régie's requirements.

## Orientation 2
## Improve the division's profitability

To improve its profitability and efficiency, Hydro-Québec Distribution plans to exercise strict cost control, continue developing its most profitable markets, improve demand management and energy efficiency in Québec, and request rate increases in 2004, 2005 and 2006 while avoiding rate shock for consumers.

*Distribution System (km)*



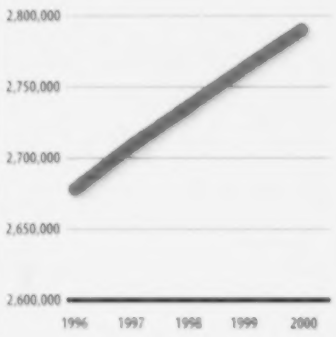

### Strategy 2.1
### Continue strict cost control

The changes in electricity distribution activities over the past few years and the improvement of service quality have put pressure on Hydro-Québec Distribution's costs.

During this period, the division has exercised strict cost control, which has kept the growth in payroll and other direct costs in line with inflation, while capital investment has been maintained at $500 million per year.

Over the next few years, Hydro-Québec Distribution expects to absorb the growth in demand, customer base and the distribution system in such a way as to keep costs stable. Investments that contribute to long-term operability but do not generate additional revenue will represent 1.6% per year of the original value of fixed assets in operation. Moreover, proposed investments such as those related to business development and quality improvement will have to be approved by the Régie de l'énergie.

*Number of Customers*




For Hydro-Québec Distribution, strict cost control remains key to ensuring that its productivity and efficiency improve constantly, as the following ratios show:

- Payroll and other direct costs will decrease from $327,000 per million dollars of net revenue in 2000 to $290,000 per million dollars of net revenue in 2006, for an annual reduction of 1.9%.

- Net revenue per employee (excluding supply and transmission costs) will rise from $220,000 in 2000 to $259,000 in 2006, for an annual increase of 2.9%.

- Work force per TWh of sales will drop from 47 in 2000 to 44 in 2006, an annual improvement of 1.3%.

Strategy 2.2

## Develop markets while maximizing the added value for Québec

### *Maintain and develop the most profitable markets*

Hydro-Québec Distribution has always favored different business strategies to reduce the division's overall cost of service and its customers' bills. Depending on the energy context, this is achieved through maintaining, developing or adjusting its sales.

In yet another effort to improve profitability while maintaining low rates, the division will continue marketing its products by promoting the efficient use of electricity, load management and energy conservation in all markets.

In particular, Hydro-Québec Distribution will continue developing a more proactive approach in order to satisfy the needs of its commercial and institutional customers, and to promote the use of electricity. In this regard, the division plans to favor business actions that focus primarily on the quality of its personalized consulting services. These will consist in, among other things:

- actively promoting its products and services, its expertise and the advantages of electricity: competitive price, favorable cost of purchasing and maintaining equipment, flexibility, reliability and cleanliness, etc.

- improving and refocusing its core activities on support and consulting services, especially in the area of heating, ventilation and air conditioning (HVAC)

- working with partners in the field to optimize, promote and install electrical HVAC solutions
- continuing R&D with respect to various applications for electricity, in order to develop and maintain its leadership in the field

Moreover, since the Régie de l'énergie recently approved the Electrotechnology Implementation Support Program, Hydro-Québec Distribution plans to help its customers, especially small and medium-sized industries, to improve their competitiveness. The business approach is based on offering advice and technical assistance in setting up projects and on offering financial assistance in the form of a loan guarantee for technology implementation.

National and international industrial business development activities will also be pursued, targeting sectors that have a high value-added component for Québec, especially in terms of the number of jobs created per megawatt of new demand. Here too, the goal will be to foster the emergence and expansion of businesses that help diversify Québec's economy.

### *Improve demand management and energy efficiency*

With respect to load management, efforts will be made to encourage customers to redistribute their use of electricity throughout the day in order to reduce supply costs and ensure that rates remain low and stable over the long term.

Over the next few years, Hydro-Québec Distribution therefore plans to update its load management strategy in order to evaluate its energy management potential and profitability for customers based on its cost structure. To this end, the division plans to submit a request for the elimination of the dual energy rate in commercial, institutional and industrial markets (Rate BT). The removal of this rate option would be accompanied by transitional measures to minimize the impact on the customers affected. In 2002, Hydro-Québec Distribution will also initiate discussions with industrial associations in order to renew its interruptible power program for large-power customers. As well, beginning in 2004, the division plans to offer all customers new rate programs and options that better reflect the real cost of supply over the long term.

As it did in the last Strategic Plan, Hydro-Québec Distribution intends to continue playing a major role in the area of energy efficiency. Following the review of the energy-conservation potential established in concert with the Agence de l'efficacité énergétique, Hydro-Québec will develop an overall energy efficiency plan, which will be submitted to the Régie de l'énergie in 2002. Appendix 3 presents a summary of the actions taken in the past and the new energy efficiency strategies that the company plans to adopt.

### *Continue developing assets and know-how*

Through the corporate subsidiary Hydro-Québec ValTech, Hydro-Québec Distribution markets technologies related to its core activities. The division thus develops its assets and know-how, while helping to improve its financial performance.

### *Target low-risk projects on the world market*

On the international stage, Hydro-Québec Distribution plans to focus its efforts on low-risk technical assistance projects, with priority for French-speaking nations. The division will also offer technical assistance to Québec businesses, helping them to develop their international operations.

## Strategy 2.3
## Increase rates as of 2004, while avoiding rate shocks

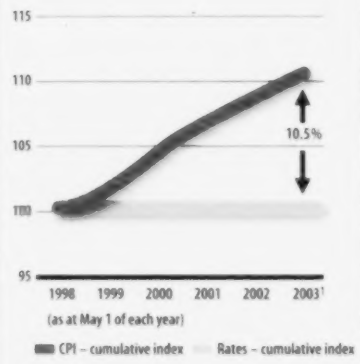
As promised, Hydro-Québec has maintained its rates at 1998 levels. Québec customers have therefore continued to benefit from low rates in a context of rapidly rising fuel prices.

*Uniform rates throughout Québec*

*Low rates, especially for residential customers*

At the request of the Québec government, Hydro-Québec Distribution will extend its rate freeze until April 2004. During this period, efforts will be made to consolidate the gains achieved in terms of service quality.

***Electricity Rates and the Consumer Price Index***




*1. Freeze maintained until April 30, 2004.*

Subsequently, while maintaining rate cross-subsidization as set forth in the *Act to amend the Act respecting the Régie de l'énergie*, Hydro-Québec Distribution will have to submit its rate increases to the Régie de l'énergie for approval. The division aims to raise its rates in order to obtain a normal return in a regulated environment, while avoiding the type of rate shock suffered in 2001 by customers of distributors in California and Ontario. The rate increases will improve the division's profitability, finance the investments needed to enhance the quality of its services, and ensure the power supply required to meet the growing needs of Quebecers. This is why the Régie will take a special look at various projects and activities that exert upward pressures on costs, such as system undergrounding, adoption of new business information systems, and energy efficiency programs.

Hydro-Québec Distribution plans to propose rate increases while avoiding rate shocks for its customers. However, electricity prices will still be much more stable over the long term than the generally volatile prices of other energy sources. Increases aligned with the growth in the consumer price index (CPI) as of 2004 are presented for illustration purposes in the section entitled "Financial Outlook".

## Strategy 2.4

## Take advantage of technological innovation

The areas of technological innovation likely to offer attractive opportunities for Hydro-Québec Distribution are the following:

- Improve the quality of electricity service
  - Reduce the service average interruption duration per customer to 2.35 hours per year
  - Improve the system's resistance to extreme weather conditions (ice storms)
  - Provide power quality that complies with international standards
- Reduce underground system costs
  - Reduce the cost of the existing underground system by 10%
  - Reduce the cost of new underground lines (i.e., extensions into medium-density areas) by 50%
  - Reduce the cost of undergrounding overhead lines by 25%
- Reduce the cost of the overhead system by 10%
- Develop profitable new sales while promoting the efficient use of energy
- Lower the distributor's supply cost
- Increase the satisfaction of residential customers
- Maintain sales in commercial and institutional markets which are subject to competition, with a view to profitability

To maximize the impact of its research and development efforts, the division and its internal partners will continue to select projects carefully and to reassess their relevance and chances of success at certain key stages.

# TransÉnergie

**Fixed assets as at Dec. 31, 2000**
$16.2 billion

**Revenue in 2000**
$2.6 billion

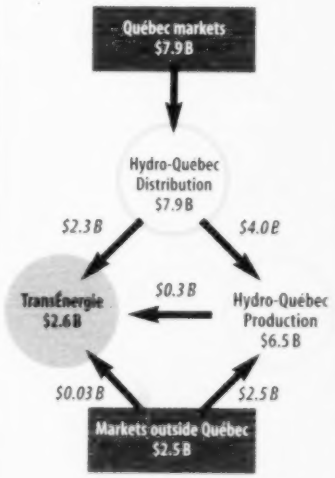
**Main customers in 2000 (% of revenue)**
Hydro-Québec Distribution: 86.6%
Other wholesalers: 11.8%
International market: 1.6%

**Number of employees as at Dec. 31, 2000**
3,155

**Regulatory regime**
Cost-based

# TransÉnergie

*Revenue Flow Among the Divisions— Electricity Segment* (2000)




*$ B: billions of dollars*

## Mandates

- **Transmit electricity and profitably market its transmission capacity to match the level of quality its customers expect**
- **Ensure system reliability and the long-term operability and growth of its transmission assets, while observing environmental standards and regulations**
- **Manage power movements in the Québec Control Area at the lowest possible cost and according to the quality expected, in compliance with system reliability rules**
- **Use its transmission expertise to develop, manage and operate profitable international activities**

## Orientations for 2002–2006

1. **Offer customers value-added transmission service**
2. **Maintain the reliability and integrity of the system operated by TransÉnergie, the only regional transmission organization in Québec**
3. **Ensure the division's profitability, in particular by seizing international business opportunities**

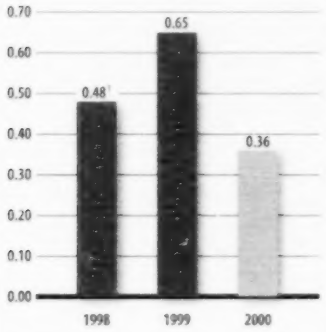
## Orientation 3
## Offer customers value-added transmission service

The development of electricity transmission activities is crucial to satisfying Québec customers and creating value for the shareholder. TransÉnergie meets the highest industry standards, with a 0.65-hour target for SAIDI (Service Average Interruption Duration Index), and thus is able to offer reliable and high-quality transmission service to its customers.[1]

TransÉnergie plans to continue improving service quality in order to adequately meet the expectations of its customers, namely, Hydro-Québec Distribution, producers and wholesalers. Four strategies are planned to support this orientation:

- Ensure that capacity is available when customers need it, and provide services adapted to their needs.
- Realize the full import and export capacity of interconnections.
- Update business practices and the transmission service contract, if necessary, in light of changing rules in the U.S. Northeast, especially as regards system congestion.
- In technology development, give priority to innovations designed to ensure long-term system operability and performance.

***Service Average Interruption Duration Index***




*1. Does not take into account interruptions due to exceptional weather conditions.*

*Service interruptions are attributable to power failures or scheduled outages.*

## Strategy 1.1

## Ensure that capacity is available when customers need it, and provide services adapted to their needs

*TransÉnergie interconnections*

- *Export capacity: 6,125 MW*
- *Import capacity (including Churchill Falls): 9,405 MW*

To efficiently transmit the electricity required by Quebecers, while guaranteeing profitable power movements for its customers, TransÉnergie plans to optimize the management of its transmission system.

To provide real added value for its customers, TransÉnergie intends to adapt its business relations to market forces on the basis of rapid, fair and equitable processing of service requests. As for the environment, TransÉnergie will do everything necessary to obtain ISO 14001 certification in 2002 and to maintain it thereafter. Its regard for the environment mainly takes the form of respecting property when carrying out work and of controlling the risk of spills.

## Strategy 1.2

## Realize the full import and export capacity of interconnections

*Technical and commercial means to develop wheeling capacity*

In its power movement operations in the U.S. Northeast, TransÉnergie plans to use technical and commercial means to develop the full capacity of its interconnections.

In this regard, the division will continue seeking out technical solutions that will increase wheeling capacity. One example is the use of new interconnection technologies, such as variable-frequency transformers, to boost capacity. TransÉnergie will continue to participate in technical committees in the United States (North American Electric Reliability Council (NERC), Northeast Power Coordinating Council (NPCC), etc.) and maintain contact with regulatory bodies whose mandates include transmission (Régie de l'énergie, FERC, etc.).

TransÉnergie also plans to increase the availability of wheeling capacity by working with neighboring systems to lift restrictions on the import and export capacities of interconnections with New York State and New England. A major objective is to obtain open, nondiscriminatory access to New England's system following the expiry of the firm-energy contract with New England Utilities (NEU) on August 31, 2001.

## Strategy 1.3

## Update business practices and the transmission service contract, if necessary, in light of changing rules in the U.S. Northeast, especially as regards system congestion

*Compliance with new rules being developed in neighboring systems*

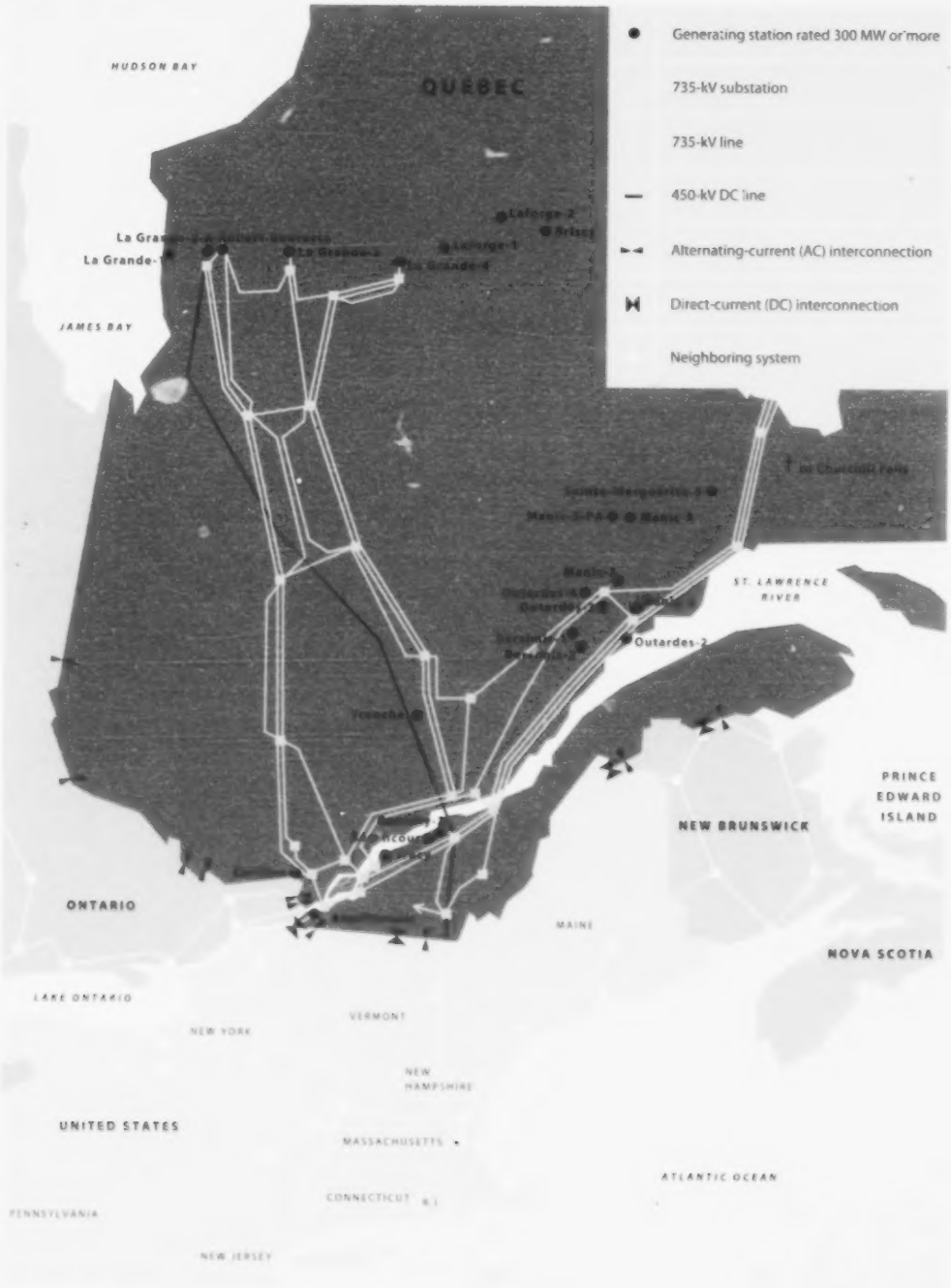
TransÉnergie plans to update its business practices and, if necessary, the Hydro-Québec transmission service contract adopted in 1997, taking into account the new rules being developed in neighboring systems, especially to address problems of congestion. The new rules proposed by the division will be submitted to the Régie de l'énergie for approval, if necessary.

In neighboring systems, power exchanges for congestion management are increasingly replacing the approach based on transmission rights (which is used by TransÉnergie). Access to transmission is tied to the success of electricity sale and purchase offers on these markets. Hence, TransÉnergie must make sure that the sale of capacity on its system is compatible with the rules being developed in neighboring systems.

TransÉnergie will also ensure that rules of reciprocity are applied by neighboring systems, particularly when the Ontario and New Brunswick markets are opened.

QUÉBEC
Laforge-2
Brisay
La Grande-2-A Robert-Bourassa
La Grande-3
Laforge-1
La Grande-4
to Churchill Falls
Sainte-Marguerite-3
Manic-5-PA
Manic-5
Manic-3
Outardes-4
Outardes-3
Manic-2
Bersimis-1
Bersimis-2
Outardes 2
Tremblay
Gentilly
Bécancour
Tracy
Carillon
Beauharnois
ONTARIO
NEW BRUNSWICK
PRINCE EDWARD ISLAND
NOVA SCOTIA

*Hydro-Québec's Major Facilities*



Strategy 1.4

## In technology development, give priority to innovations designed to ensure long-term system operability and performance

TransÉnergie's technological innovation program is based on the division's mandates. Efforts will focus on the development of high-performance equipment with a long useful life. The improvement percentages proposed to researchers constitute major challenges.

The following five major themes have been selected:

- Increase the useful life of certain types of equipment by 10% and lower maintenance costs for designated equipment by 10%.
- Reduce the cost of building new lines and substations by 10%.
- Increase the capacity of designated corridors by 33%.
- Optimize transmission system management.
- Reduce the impact of extreme weather conditions by 50%.

*Ensure long-term operability and performance*

## Orientation 2

# Maintain the reliability and integrity of the system operated by TransÉnergie, the only regional transmission organization in Québec

*TransÉnergie: Québec's regional transmission organization*

As the only regional transmission organization (RTO) in Québec, TransÉnergie is responsible for the reliability and security of Québec's transmission system. The division plans to use two strategies to maintain the reliability and integrity of the transmission system:

- Ensure continuity and reliability of transmission service.
- Maintain system integrity.

## Strategy 2.1

## Ensure continuity and reliability of transmission service

*Secure power supply*

- *Loop construction*
- *1,250-MW interconnection with Ontario*

To improve the security of supply for Quebecers, TransÉnergie plans to complete the projects authorized after the 1998 ice storm, including the system loop in Montérégie. It also intends to build a 1,250-MW interconnection with Ontario by 2005, provided that the investment would be profitable under Québec transmission rules.

In terms of reliability, TransÉnergie plans to ensure that the system meets the technical requirements of regulatory bodies such as the NERC and the NPCC, and to lobby the relevant bodies.

In order to reduce the impact of exceptional weather events, TransÉnergie will continue its development work to protect transmission equipment against the risk of ice. In particular, the division will continue working to adopt new de-icing and mechanical reinforcement techniques.

## Strategy 2.2
## Maintain system integrity

TransÉnergie will continue performing all the functions of its role as an integrated transmission provider in Québec. To this end, the division will ask the Régie de l'énergie to approve the NERC and NPCC reliability and security rules which it already applies. In so doing, it will raise its profile as the manager responsible for reliability and security in the Québec Control Area and for the marketing of capacity on its system.

*Perform the functions of an integrated transmission provider in Québec*

# Orientation 3
# Ensure the division's profitability, in particular by seizing international business opportunities

Maintaining TransÉnergie's profitability, with a view to creating shareholder value, involves controlling expenses, generating a reasonable return on transmission activities in Québec, and seeking international business opportunities, in accordance with criteria established by Hydro-Québec.

## Strategy 3.1

## Control expenses needed to provide transmission service

TransÉnergie will continue its efforts to control expenses while ensuring the long-term operability of transmission assets. Spending that prolongs useful life but does not generate additional revenue will be equivalent to 1.3% of the original value of fixed assets in operation.

TransÉnergie also plans to work with other industry players to optimize the geographic planning of load growth and the integration of new production sources into the grid. The division will rely on its transmission expertise to advise project proponents as they choose locations and integration strategies.

## Strategy 3.2

## Achieve the return authorized by the Régie de l'énergie

TransÉnergie is seeking the Régie's approval for rates that reflect the transmission costs associated with the needs of all customers as well as a reasonable rate of return on shareholder's equity. To this end, the division filed a rate case in May 1998, requesting a review of transmission rates as of January 1, 2001. The decision is expected by the end of 2001.

The division will also propose that performance-based incentive regulations be implemented in Québec. Such regulations would foster continuous improvement of public utility performance through various mechanisms whereby the savings generated by reductions in the cost of service would benefit both the company and its customers. As a result, TransÉnergie would switch from a regulatory system based on the cost of transmission service, to one where rates are regulated through incentive measures.

## Strategy 3.3

## Seize international business opportunities in accordance with the criteria established by Hydro-Québec

Hydro-Québec's expertise in high-voltage transmission is in great demand worldwide. The company is solicited for its know-how in the design, development and management of complex projects in transmission; engineering and construction of interconnection lines; system management; installation of grid control systems; and installation of optical fibres on live lines.

*World-renowned expertise in power transmission*

Consequently, TransÉnergie plans to seize business opportunities on different markets outside Québec. The division is making the most of its many advantages in an international market where there are relatively few companies with expertise in power transmission. As a world-class transmission provider, TransÉnergie can market its expertise and technological edge with respect to high-voltage transmission.

TransÉnergie is already active in Peru, Australia, the United States and Chile. The division has carried out many transmission projects, thus opening up new markets for its services and know-how, such as live-line work, system studies, and technological products resulting from its innovation efforts.

The division intends to develop its business in stages, based on the availability of its expertise. In its choice of projects, TransÉnergie will favor those that keep capital outlay to a minimum, whether through a public offering or through the establishment of partnerships that ensure a fair distribution of risk.

Over the Strategic Plan period, TransÉnergie expects to invest up to $300 million more in transmission projects on international markets.

*$300 million in additional capital*

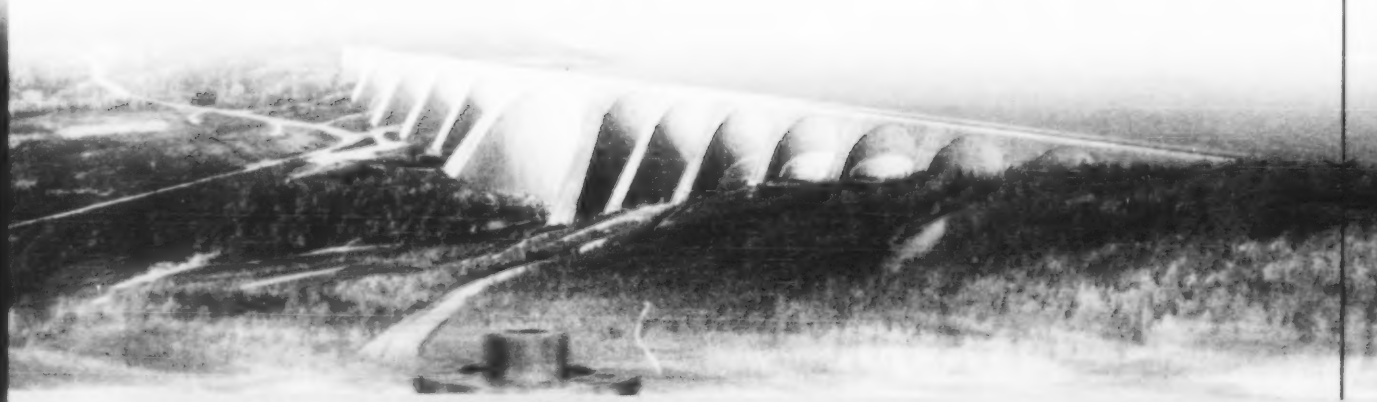
*On the international scene*

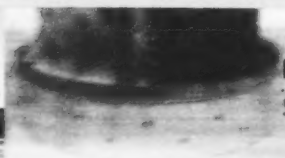
- *Build and operate merchant lines in the United States*
- *Acquire transmission assets in the Southern Cone (South America)*

TransÉnergie thus plans to develop market-based transmission projects in the United States. More specifically, the division plans to build and operate merchant lines south of the border in areas where transmission systems are congested. According to the merchant line concept, transmission rates are based on energy price differentials between interconnected markets, rather than on costs tied to a fixed rate of return.

TransÉnergie will also continue to acquire power transmission assets in a regulated context in the Southern Cone (South America) by building on the Transelec grid in Chile, and using it as a base for further development in the region.

# Hydro-Québec Production





**Fixed assets as at Dec. 31, 2000**
$23.3 billion

**Revenue in 2000**
$6.5 billion

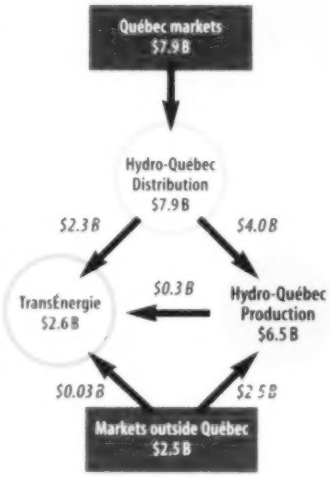
**Main customers in 2000 (% of revenue)**
Hydro-Québec Distribution: 61.4%
Other wholesale markets: 36.4%
Other international markets: 2.2%

**Number of employees as at Dec. 31, 2000**
3,142

**Regulatory regime**
Heritage pool electricity (maximum volume of 165 TWh) at a fixed rate for Hydro-Québec Distribution
Above that volume and outside Québec: deregulated activity

# Hydro-Québec Production

*Revenue Flow Among the Divisions—Electricity Segment (2000)*




*$ B: billions of dollars*

## Mandates

- **Sell electricity on wholesale markets inside and outside Québec**
- **Operate Hydro-Québec's generating facilities and reservoirs**
- **Develop Québec's hydroelectric potential**
- **Develop thermal generation on a selective basis**
- **Conduct trading of electric power and related energy products on North American markets**
- **Manage holdings, investments and professional services in the field of electricity generation on international markets**

## Orientations for 2002–2006

1. **Ensure the steady growth of electricity sales on wholesale markets and of generating facilities in Québec**
2. **Achieve a significant increase in the division's profitability**
3. **Ensure the reliability and quality of operations and promote technological innovation**

Orientation 1

## Ensure the steady growth of electricity sales on wholesale markets and of generating facilities in Québec

Hydro-Québec has developed a highly competitive hydroelectric capacity in Québec, making it one of North America's leading producers. The growth of accessible and profitable electricity markets in Québec and throughout the northeastern part of the continent encourages Hydro-Québec Production to continue developing its generating capability, with particular emphasis on Québec's own hydroelectric potential.

Over the *Strategic Plan 2002–2006* period, Hydro-Québec Production aims to achieve annualized sales in excess of $7 billion, thanks to an increase of at least 12 TWh in annual generating capability.

In order to increase its generating capability and sales—particularly electricity sales on wholesale markets—five strategies will be implemented:

- Continue to develop competitive hydroelectric projects
- Initiate and carry out thermal generation projects on a selective basis
- Purchase electricity from independent power producers under market conditions
- Continue to develop trading of electric power and related products
- Seize international business opportunities with strong potential for profitability

***By the end of 2006:***

- *Annualized sales of $7 billion*
- *12-TWh increase in annual generating capability*

All projects will have to meet the following three conditions:

- be profitable under market conditions
- be environmentally acceptable
- be well received by local communities

## Strategy 1.1
## Continue to develop competitive hydroelectric projects

Hydro-Québec Production plans to continue developing the hydroelectric potential in and around Québec, as it has done over the past 40 years. This orientation reflects both the economic benefits of competitive hydroelectric projects and the many environmental advantages of hydroelectricity.

***Hydro-Québec Production – Energy Balance 2001–2006*** *(TWh)*

| | 2001 | 2006 | 2001–2006 |
|---|---|---|---|
| **Generating capability** | | | |
| Current generating facilities and long-term purchases | 186 | 186 | – |
| Deliveries received under agreement | 2 | – | (2) |
| Sainte-Marguerite-3 | – | 3 | 3 |
| Other committed projects (Toulnustouc, Mercier, etc.) | – | 4 | 4 |
| **Total supply** | **188** | **193** | **5** |
| **Sales commitments** | | | |
| Sales in Québec—heritage pool electricity | 154[1] | 165 | 11 |
| Sales outside Québec—long-term contracts and commitments | 7 | 2 | (5) |
| Other obligations and electricity losses | 19 | 19 | – |
| **Total commitments** | **180** | **186** | **6** |
| Capacity for additional sales | 8 | 7[2] | (1) |

1. *Actual temperature. At normal temperatures, sales would be 0.4 TWh higher.*
2. *Under average runoff conditions, excluding purchase-resale transactions outside Québec. In 2006, Hydro-Québec Distribution will solicit tenders from producers for the purchase of approximately 2 TWh, some or all of which may come from the additional sales of Hydro-Québec Production.*

Over the Strategic Plan period, Hydro-Québec Production plans to invest $1,700 million in a number of hydroelectric projects. These include the Toulnustouc and Péribonka developments, as well as projects involving the partial diversion of rivers to increase the capacity of existing generating stations, including those of the Betsiamites watershed. By the end of 2006, new hydropower facilities, including Sainte-Marguerite-3 generating station, are expected to increase installed capacity by 1,800 MW and boost annual energy output by 7 TWh. Furthermore, the division will continue to work toward implementation of the Lower Churchill River project, in Labrador, and the Eastmain-1 generating station project, which includes the partial diversion of the Rupert River, in the James Bay region.

***Hydroelectricity—end of 2006:***

- *Additional installed capacity of 1,800 MW*
- *Additional energy output of 7 TWh*

## *Make projects more acceptable to host communities*

Acceptance by local communities is one of the essential conditions for completing the development of hydroelectric potential. Hydro-Québec Production will continue to propose business partnerships with host communities for all phases of new projects, from the planning stage to completion to shared ownership of future hydroelectric facilities. Partnership proposals will be based on the Toulnustouc model in the case of new generating stations and on the Betsiamites model in the case of partial diversions.

***Partnerships***

- *Toulnustouc project*
- *Betsiamites projects*

Hydro-Québec Production will continue to develop strategies and means of carrying out projects competitively, while offering significant business opportunities to local and regional companies in the form of contracts or subcontracts. For the Sainte-Marguerite-3 project, for example, nearly $500 million will have been injected into the regional economy by the end of 2001. During the construction phase, 69% of workers on the site were from the Côte-Nord region. The experience gained will be applied to future projects.

Hydro-Québec Production will also pursue the process of consulting with host communities. Regional information and discussion forums enable host communities to closely monitor generation projects, from the start-up phase to commissioning.

### *Reduce construction lead times and costs*

The profitability of hydroelectric projects is closely linked to construction lead times and the ability to control costs while meeting quality standards and environmental requirements. Reducing construction lead times at all stages of a project has a direct impact on profitability. It lowers the amount of capitalized interest on financing during construction and allows the company to begin drawing revenue from the project sooner. Over the medium and long terms, Hydro-Québec Production aims to reduce its construction costs by at least 10% and to shorten the duration of construction work.

Hydro-Québec Production will also continue to work closely with the proper authorities to find ways of speeding up the project approval and environmental review processes.

## Strategy 1.2
## Initiate and carry out thermal generation projects on a selective basis

*Thermal generation projects based on the best technologies available*

Hydroelectric generation has many benefits and remains the option of choice for Hydro-Québec Production. However, it also presents significant challenges in terms of acceptance by host communities and environmental assessment. Recent experience has demonstrated the scope and complexity of these challenges.

In this context, and without replacing any hydroelectric projects, Hydro-Québec Production plans to initiate and carry out a number of carefully selected thermal generation projects, so as to take full advantage of profitable business opportunities on wholesale markets in and around Québec. The division will use the best technologies available, chosen to meet the particular requirements of each project, thus ensuring optimal operating efficiency and compliance with environmental standards.

In view of the time needed to obtain the necessary government authorizations, the first natural gas-fired generating station—the $550-million Suroît combined-cycle plant, on the south shore of the St. Lawrence—could come on stream in late 2006, providing additional power for the winter of 2006–2007.

This strategy will allow Hydro-Québec Production to benefit from diversification by combining the performance of the best thermal-generation technologies available with that of hydroelectric generating stations and reservoirs. In addition, the division will gain more flexibility in terms of available capacity, allowing it to serve its customers well, especially Hydro-Québec Distribution.

## Strategy 1.3

## Purchase electricity from independent power producers under market conditions

In addition to building new generating stations, Hydro-Québec Production plans to obtain additional supplies by means of long-term contracts with independent power producers in Québec. Supply sources will be diversified, and quantities will depend on availability and market conditions. Priority will be given to renewable energy sources.

More specifically, Hydro-Québec Production plans to support the development of Québec's wind-power potential through a targeted purchasing program, the terms of which will be determined in collaboration with the relevant authorities. These supplies should come from a wind-power industry to be developed and consolidated in the Gaspé region. Purchases could amount to 50 MW per year, starting in 2004 or 2005. The purchase price will depend on market conditions and will probably be around 5 to 6 cents per kilowatthour. The division will also purchase power from small hydroelectric generating stations under a plan for the allocation and use of publicly owned water resources for generating stations of 50 MW or less, announced by the Québec government on May 24, 2001.

*Purchases from independent producers*

- *Wind power*
- *Small hydropower facilities*

## Strategy 1.4

### Continue to develop trading of electric power and related products

While fulfilling its commitments on the Québec market—in particular, its commitment to supply Hydro-Québec Distribution with 165 TWh of heritage pool electricity at an average commodity rate of 2.79 cents per kilowatthour—Hydro-Québec is active on regional energy markets in northeastern North America. This type of activity, known as trading, focuses on the sale of surplus electricity produced in Québec, the purchase of electricity for resale, and price arbitraging within certain markets. One of the main reasons for trading is to capitalize as much as possible on hydroelectric assets. The company's reservoirs and the transmission capacity that can be booked by contract on TransÉnergie's system are among the most important tools for this type of activity.

*Power trading on northeastern markets*

Over the 2002–2006 period, Hydro-Québec Production plans to continue and cautiously expand these operations. The division will participate in new markets, such as the Ontario wholesale market, as they become available. It will also be an active player on markets for new products such as electricity options, weather derivatives, and emissions credits. Finally, it will expand its trading operations to include natural gas, thus supporting the proposed thermal generating capacity of the Suroît plant.

## Strategy 1.5

### Seize international business opportunities with strong potential for profitability

Hydro-Québec Production plans to focus its international activities on the acquisition and management of hydroelectric assets with power trading potential. Since these assets are deemed to be strategic by the countries involved as well as by major industrial players, profitable business opportunities for Hydro-Québec Production—and hence actual investments—are expected to be limited.

Hydro-Québec Production will continue to seek out business opportunities in a highly competitive global market. The division therefore plans to continue expanding from its current footholds, particularly in Central America, and to maintain its stake in Meiya Power Company in China.

The division will continue to develop technical assistance services in other countries, especially the U.S. market for specialized maintenance and refurbishing of hydroelectric facilities. The advanced skills and technical know-how of its personnel will be its main advantage in this sector.

## Achieve a significant increase in the division's profitability

Hydro-Québec Production is aiming for substantial growth in net income over the term of the Strategic Plan, largely on the strength of sales growth. By the end of 2006, it is targeting a $500-million increase in net income over 2000, assuming average runoff conditions between now and 2006.

Keeping a tight rein on operating expenses is one of many ways to achieve this goal. In addition, the division will limit investments designed to ensure long-term operability to 1.2% of the original value of fixed assets, without compromising the long-term reliability of its generating facilities.

In an effort to control and actively manage the financial risks associated with its commercial activities (electricity sales over and above its firm commitments, trading operations, etc.), Hydro-Québec Production plans to continue developing its risk management tools and following the industry best practices in this regard.

## Orientation 3

# Ensure the reliability and quality of operations and promote technological innovation

Managing Hydro-Québec Production's activities profitably means not only controlling expenses and managing risk, but also keeping up reliability best practices and technological innovation efforts focused on improving the performance of generating facilities.

Hydro-Québec Production is aiming for improvements in the following performance indicators by the end of 2006:

- generating unit efficiency
- industrial accident rate
- employee motivation index
- efficiency of activities, especially in terms of productivity per employee and return on capital employed

## Strategy 3.1

## Maintain reliability criteria in the management of generating facilities

In order to reliably deliver heritage pool electricity under the terms and conditions stipulated by law and to generate profitable sales at competitive prices in unregulated markets, Hydro-Québec Production will maintain its current practices with regard to security and reliability of supply, including the following imperatives:

- maintain a sufficient energy reserve to cover a 64-TWh runoff deficit over two consecutive years
- maintain a 10% to 12% capacity reserve for the heritage pool, equivalent to a load-shedding risk of 2.4 hours per year (North American standard)

Security of supply for the heritage pool depends on effective management of runoff risk, both annual and multiannual. An essential tool for this purpose is the capacity to import electricity through interconnections. Hydro-Québec Production will therefore ensure that TransÉnergie, its transmission provider in Québec, guarantees reliable access to import capacity on existing interconnections.

*Reliability*

- *Energy and capacity reserves*
- *Import capacity through interconnections*

Hydro-Québec Production will also continue to review its maintenance practices with the aim of extending generating unit availability. As a major customer of transmission systems both inside and outside Québec, the division will take a particular interest in improving the efficiency of interconnection management, in order to reduce unavailability. It will also make sure it has nondiscriminatory access to all interconnection capacity between Québec and neighboring markets.

## Strategy 3.2
## Continue the technological innovation program

Hydro-Québec Production's technological innovation activities will focus on developing solutions for improving the performance of generating facilities, ensuring their long-term operability, and reducing operating and construction costs.

With this in mind, technological innovation efforts will be directed towards four major research challenges:

- performance and long-term operability of generating units as well as electrical and mechanical equipment: increase useful life by 10%, availability by 1%, and efficiency by 0.5%
- profitability of generating assets: increase energy capability by 0.5%
- long-term operability of dams and other structures: increase useful life by 10%
- new methods for the construction of large-scale facilities: cut construction costs by 10% and reduce construction lead times by one year

# Hydro-Québec Ingénierie, approvisionnement et construction

**Sales in 2000**
$1.4 billion

**Main customers in 2000 (% of revenue)**
Hydro-Québec Production: 49%
TransÉnergie: 33%
Hydro-Québec Distribution: 10%
Other: 8%

**Number of employees as at Dec. 31, 2000**
3,024

**Regulatory regime**
Not applicable

# Hydro-Québec Ingénierie, approvisionnement et construction

## Mandates

- **Provide strategic advice and engineering and procurement services, and carry out energy-related construction projects both nationally and internationally**
- **Provide orientations, guidelines, strategies and services related to procurement and services to Hydro-Québec units**
- **Manage the activities of Société d'énergie de la Baie James, a Hydro-Québec subsidiary**

## Orientations for 2002–2006

1 **Improve the management of shared services offered to Hydro-Québec divisions**

2 **Promote engineering and construction know-how in power generation and transmission**

Orientation 3

## Improve the management of shared services offered to Hydro-Québec divisions

The profitability and reliability of power generation and transmission activities are largely a function of the quality of facility design and the stringent management of procurement and construction processes. The expertise developed by Hydro-Québec Ingénierie, approvisionnement et construction must not only contribute to the profitability of the company's other divisions, but also enhance the marketing of Québec's know-how in the energy field.

Over the next few years, Hydro-Québec Ingénierie, approvisionnement et construction will participate in projects involving the refurbishment of generating stations, reinforcement of the transmission system and development of Québec's hydroelectric potential.

As these projects are carried out, the division will promote environmental protection, reduce construction lead times and work to ensure that projects are well received by local communities. Among other things, it intends to reduce the time required to obtain construction permits by proposing that the guidelines governing environmental impact studies be optimized. While working toward better-targeted guidelines, the division will ensure that changes in the application of provincial and federal regulations result in speedier project development.

Even though the details of investment programs in generation and transmission have not yet been finalized, the division is projecting annual sales of approximately one billion dollars for the Strategic Plan period.

Hydro-Québec Ingénierie, approvisionnement et construction intends to optimize the management of the shared services it provides to other Hydro-Québec divisions. It will do so by reducing its own costs and improving processes used by client divisions, especially with regard to procurement and services.

*Projects:*

- *Refurbishment of generating stations*
- *Reinforcement of the transmission system*
- *Development of hydroelectric potential*

For example, the division will freeze shared-service fees over the Strategic Plan period. It will also improve its construction concepts and methods, which will allow it to generate savings of 4% per year on investment projects. Project management fees should be maintained at 14%. To this end, the division plans to monitor its project costs very carefully.

*Optimized management of shared services offered to other divisions*

It should be noted, however, that difficulties in obtaining permits could lead to a significant drop in annual sales related to generation and transmission investment projects. Achieving the 14% target for management fees could therefore be compromised, since it is based on minimum annual sales of $800 million before borrowing costs.

## Orientation 2

## Promote engineering and construction know-how in power generation and transmission

*Develop the most promising market niches*

Hydro-Québec Ingénierie, approvisionnement et construction plans to focus its international operations on the Americas and to develop the most promising market niches in areas where it has a high level of expertise:

- rehabilitation and optimization of hydroelectric generating stations in the United States
- installation of optical fibres on live power lines
- installation of power-grid control systems
- engineering and construction of interconnection lines in South America

Hydro-Québec Ingénierie, approvisionnement et construction, in collaboration with Hydro-Québec Production and TransÉnergie, will work with consulting engineering firms to carry out investment projects. To ensure that it chooses profitable projects while minimizing its risks on international markets, the division will continue to strictly apply its risk management process and seek out business partners to develop targeted market niches.

# Financial and Economic Outlook

## Financial Outlook for the *Strategic Plan 2002–2006*

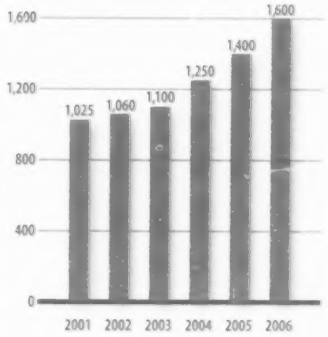
The orientations of the *Strategic Plan 2002–2006* will not only consolidate the quality-of-service gains of the past few years, but will also improve the company's financial position. Return on shareholder's equity will remain stable throughout the rate freeze period and then show steady growth as of 2004.

The following analysis is based on the most recent financial projections arising from the economic and energy parameters forecast in this Plan. The economic slowdown at the end of 2001 and uncertainty as to the timing of an eventual recovery may affect actual results. The parameters used and the financial outlook are therefore presented for illustration purposes only and may be subject to significant variability in the short term, as indicated in this chapter's sensitivity analysis.

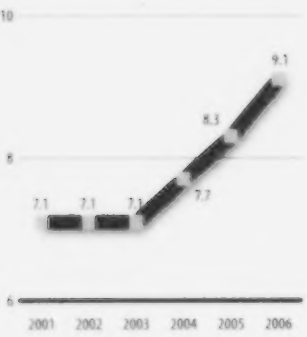
## Consolidated Results

The improvement of the past few years should continue in 2001. Consolidated net income should reach the previous Strategic Plan target of $1,025 million and is expected to rise to $1,600 million by 2006, mainly on the strength of domestic sales growth. For all markets in Québec, sales volume should increase by about 1.6% a year between 2001 and 2006. Rate increases, aligned with the inflation rate and starting in May 2004, are factored in for illustration purposes only. These will account for $354 million of the $1,160-million increase in revenue from sales within Québec. The rate increases will cover additional costs, in particular those arising from non-heritage pool electricity supply, system undergrounding and energy efficiency programs.

***Net Income 2001–2006*** *($ millions)*



*Return on Equity 2001–2006 (%)*




Operating expenses will rise by $79 million over the 2002–2006 period. This moderate increase will depend upon tight control of expenses and will require sustained efforts to improve productivity

Other direct expenses are expected to total $5.8 billion in 2006, compared with $5.9 billion in 2001. The decrease can be ascribed mainly to lower spending for purchases of fuel and electricity.

Hydro-Québec's projections include a $2.2-billion financial contingency to cover variations in runoff, which gives the company an 84% probability of achieving its financial targets.

Total financial expenses (including interest, exchange losses and loan guarantee fees) will decrease over the period, reaching $3.2 billion in 2006. The decrease is mainly due to lower exchange losses.

The sustained increase in profitability will result in improved financial ratios across the board for the 2002–2006 period. Return on equity will climb from 7.1% in 2001 to 9.1% in 2006—higher than the average cost of debt but still below the industry average. Interest coverage will rise from 1.42 in 2001 to 1.55 in 2006.

***Statement of Consolidated Results** ($ millions)*

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|
| Revenue | 12,485 | 11,370 | 11,710 | 12,000 | 12,370 | 12,840 |
| *Less* | | | | | | |
| Operating expenses | 2,110 | 2,053 | 2,086 | 2,109 | 2,157 | 2,189 |
| *excl. subsidiaries and holdings* | *1,810* | *1,802* | *1,823* | *1,842* | *1,862* | *1,889* |
| Other expenses | 5,943 | 4,800 | 5,102 | 5,429 | 5,531 | 5,799 |
| *incl. financial contingency* | – | – | *400* | *600* | *600* | *600* |
| Financial expenses | 3,390 | 3,440 | 3,405 | 3,195 | 3,265 | 3,235 |
| Non-controlling interest | 17 | 17 | 17 | 17 | 17 | 17 |
| **Consolidated net income** | **1,025** | **1,060** | **1,100** | **1,250** | **1,400** | **1,600** |
| *incl. net income of holdings* | *92* | *103* | *161* | *200* | *257* | *303* |
| Dividend likely to be declared | 513 | 530 | 550 | 625 | 700 | 800 |
| Return on equity (%) | 7.1 | 7.1 | 7.1 | 7.7 | 8.3 | 9.1 |
| Interest coverage | 1.42 | 1.46 | 1.44 | 1.39 | 1.49 | 1.55 |
| Average cost of debt (%) | 8.7 | 8.5 | 8.7 | 8.5 | 8.7 | 8.6 |

Based on these forecast consolidated results, the shareholder can expect to receive $3.2 billion in dividend payments over the five-year period, in accordance with Hydro-Québec's dividend policy.

The table below shows the divisions' contributions to the consolidated results.

***Contribution of the Divisions*** *($ millions)*

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|
| ***Net income*** | | | | | | |
| Hydro-Québec Production *after financial contingency* | 1,075 | 1,045 | 1,020 | 985 | 1,065 | 1,180 |
| TransÉnergie | 535 | 450 | 545 | 520 | 550 | 545 |
| Hydro-Québec Distribution | (525) | (465) | (480) | (310) | (310) | (250) |
| Other | (60) | 30 | 15 | 55 | 95 | 125 |
| **Consolidated net income** | **1,025** | **1,060** | **1,100** | **1,250** | **1,400** | **1,600** |

## Changes in Financial Position

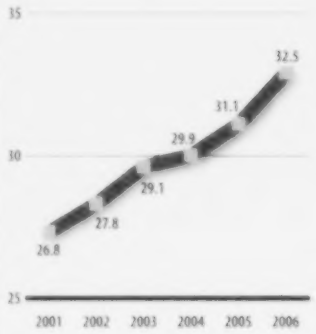
With the expected growth in operating income over the 2002–2006 period, operations will generate nearly $17.9 billion after dividends.

***Changes in Consolidated Financial Position*** *($ millions)*

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2002–2006 |
|---|---|---|---|---|---|---|---|
| ***Use of funds*** | | | | | | | |
| Capital investment | (1,950) | (2,640) | (2,450) | (3,100) | (2,760) | (2,230) | (13,180) |
| Redemptions and maturities | (3,463) | (1,897) | (3,277) | (1,405) | (2,274) | (1,643) | (10,496) |
| Dividends | (539) | (513) | (530) | (550) | (625) | (700) | (2,918) |
| | **(5,952)** | **(5,050)** | **(6,257)** | **(5,055)** | **(5,659)** | **(4,573)** | **(26,594)** |
| ***Source of funds*** | | | | | | | |
| Operations | 2,968 | 3,399 | 3,691 | 3,333 | 3,817 | 3,650 | 17,890 |
| Financing[1] | 2,984 | 1,651 | 2,566 | 1,722 | 1,842 | 923 | 8,704 |
| | **5,952** | **5,050** | **6,257** | **5,055** | **5,659** | **4,573** | **26,594** |

1. *For 2001, this includes a $205-million variation in cash and cash equivalents.*

*Capitalization*
*2001–2006 (%)*




Hydro-Québec will use these funds to finance its entire $13.2-billion capital program for the period and will allocate $1.8 billion to reducing long-term debt (the $10.5-billion repayment of debt at maturity will exceed the estimated $8.7 billion of new issues).

Self-financing for the period is estimated at 64%, a definite improvement over previous years.

## Balance Sheet

By the end of the period, fixed assets will be valued at $52 billion and total assets at $60 billion. Commissionings will be concentrated in power generation and transmission.

On the liabilities side, long-term debt will decrease by $1.8 billion between 2001 and 2006, partly due to strengthening of the Canadian dollar, causing a downward adjustment of the U.S.-dollar-denominated debt.

***Consolidated Balance Sheet*** *($ millions)*

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|
| **Assets** | | | | | | |
| Fixed assets (net) | | | | | | |
| Distribution | 7,912 | 8,044 | 8,211 | 8,415 | 8,573 | 8,696 |
| TransÉnergie | 16,198 | 16,691 | 16,940 | 17,680 | 17,955 | 17,781 |
| Production | 23,390 | 23,402 | 23,370 | 23,643 | 23,999 | 24,220 |
| Other | 2,075 | 2,001 | 1,999 | 1,778 | 1,612 | 1,434 |
| | **49,575** | **50,138** | **50,520** | **51,516** | **52,139** | **52,131** |
| Other assets | 9,445 | 9,092 | 8,515 | 8,414 | 8,086 | 8,204 |
| **Total – Assets** | **59,020** | **59,230** | **59,035** | **59,930** | **60,225** | **60,335** |
| **Liabilities** | | | | | | |
| Long-term debt | 38,132 | 36,804 | 37,612 | 36,810 | 35,966 | 36,368 |
| Non-controlling interest | 205 | 222 | 239 | 256 | 273 | 290 |
| Other liabilities | 5,892 | 6,883 | 5,313 | 6,368 | 6,790 | 5,681 |
| **Total – Liabilities** | **44,229** | **43,909** | **43,164** | **43,434** | **43,029** | **42,339** |
| Shareholder's equity | 14,791 | 15,321 | 15,871 | 16,496 | 17,196 | 17,996 |
| **Total – Liabilities and shareholder's equity** | **59,020** | **59,230** | **59,035** | **59,930** | **60,225** | **60,335** |
| **Capitalization (%)** | 26.8 | 27.8 | 29.1 | 29.9 | 31.1 | 32.5 |

Shareholder's equity will increase by $3.2 billion over the period, from $14.8 billion in 2001 to $18.0 billion in 2006, raising the company's capitalization rate from 26.8% in 2001 to 32.5% in 2006.

## Sensitivity Analysis of Consolidated Net Income Forecast for 2004

A sensitivity analysis of the net income forecast for 2004 gives an idea of the potential impact of certain business risks on Hydro-Québec.

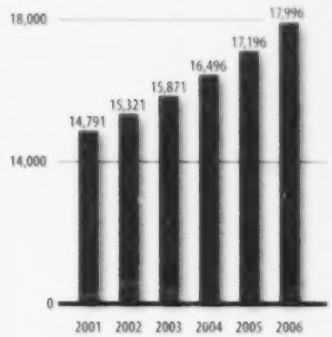
The results shown in the figure opposite cover a 68% probability range. When applied to financial risk, for instance, this analysis indicates that there is only a 16% chance that fluctuations in interest rates, exchange rates or aluminum prices will result in a drop of more than $190 million or an increase of over $180 million in net income.

Among the business risks most likely to affect net income between now and 2004 are changes in financial parameters and variations in runoff, given the nature of Hydro-Québec's generating facilities.

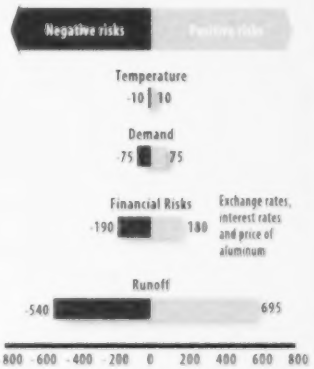
Risks related to economic parameters, such as fluctuations in interest rates, exchange rates and the price of aluminum, have been managed on an integrated basis for several years now. By using the appropriate derivative instruments, the company can keep the volatility of its financial results within certain limits, which are reviewed every year.

In planning its hydroelectric generating stations and related reservoirs, Hydro-Québec has taken variations in runoff into account. Sound reservoir management, combined with short-term transactions, will allow Hydro-Québec to keep the impact of the runoff risk at an acceptable level.

***Shareholder's Equity*** *($ millions)*




***Sensitivity Analysis of Consolidated Net Income Forecast for 2004*** *($1,250 million)*




*Note: There is a 68% probability that the value will fall within a standard deviation of ±1. Consequently, there is a 16% probability that the deviation will exceed +1 and an equal probability that it will exceed -1.*

**Main Economic Parameters**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|
| Real GDP in Québec (% change) | 4.7 | 0.7 | 0.9 | 3.0 | 2.5 | 2.5 | 2.5 |
| Canadian CPI (% change) | 2.7 | 2.4 | 1.7 | 1.6 | 1.5 | 1.6 | 2.0 |
| Price of aluminum (in US¢/lb) | 74.6 | 70.3 | 72.0 | 73.0 | 74.0 | 73.0 | 75.0 |
| Exchange rate (C$/US$) | 0.673 | 0.649 | 0.654 | 0.671 | 0.680 | 0.690 | 0.690 |
| 90-day interest rates (%) | | | | | | | |
| Canada | 5.5 | 4.4 | 4.8 | 5.4 | 5.5 | 5.5 | 5.4 |
| U.S. | 5.8 | 3.8 | 4.0 | 5.3 | 5.4 | 5.4 | 5.4 |
| 10-year+ interest rates (%) | | | | | | | |
| Canada | 6.5 | 6.3 | 6.5 | 6.4 | 6.5 | 6.5 | 6.5 |
| U.S. | 7.3 | 6.4 | 6.6 | 6.8 | 6.8 | 6.8 | 6.8 |

*Source: WEFA Group (Wharton Econometric Forecasting Associates) and Hydro-Québec, August 2001*

# Economic Impact

## Sustaining Employment

In addition to paying dividends and taxes to its shareholder, the Québec government, Hydro-Québec also makes a significant contribution to the Québec economy through its growth, capital spending and purchases of goods and services.

***Jobs Sustained by Hydro-Québec's Activities*** *(in person-years)*

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2002–2006 |
|---|---|---|---|---|---|---|
| Jobs related to operations | 20,200 | 20,100 | 20,000 | 19,900 | 19,800 | 100,000 |
| Jobs related to capital spending | 15,500 | 14,200 | 17,900 | 16,100 | 14,400 | 78,100 |
| Jobs related to commercial programs | 100 | 200 | 200 | 200 | 200 | 900 |
| Jobs related to purchases from IPPs | 800 | 800 | 800 | 800 | 800 | 4,000 |
| **Total** | **36,600** | **35,300** | **38,900** | **37,000** | **35,200** | **183,000** |

Hydro-Québec's activities, not including investments in holdings, will help sustain 183,000 person-years of emp ent in all regions of Québec over the Plan period.

Operations alone will sustain 100,000 direct and indirect jobs, while capital spending will support 78,100 more. Purchases from independent power producers (IPPs) will contribute 4,000 person-years. In addition, Hydro-Québec's 30 technology ventures in Québec employ more than 1,700 people, some of them in highly skilled jobs. This number could increase over the Plan period, especially with the anticipated development of Avestor, a joint venture for commercializing the lithium-metal-polymer battery.

## Tax Contribution

For 2002–2006, Hydro-Québec will pay over $3.3 billion in taxes to the provincial government and municipalities, in addition to $0.9 billion in loan guarantee fees and $3.2 billion in shareholder dividends. The largest component is the capital tax, which will generate close to $1.6 billion for the Québec government. This is followed by real estate tax (in the form of tax on gross revenue) of over $1.2 billion. In all, the company will pay taxes and loan guarantee fees equivalent to 70% of its net income. This is one of the largest tax contributions paid by an electricity company in North America, given Hydro-Québec's relative size within the industry.

## Regional Economic Impact

For the past few years, Hydro-Québec's presence throughout Québec has translated into purchases of goods and services worth over $1 billion annually. In 2000, these purchases were worth $1.5 billion and sustained the equivalent of nearly 10,400 direct and indirect jobs. In addition, Hydro-Québec's own employees working across the province also contribute to regional economic growth.

The geographic distribution of these economic impacts in Québec will depend on the specific projects approved and carried out during the Plan period.

Hydro-Québec's purchasing policy is designed to ensure the distribution of purchases throughout Québec, at the most favorable cost to the company.

As an agent of economic development, Hydro-Québec reaffirms its intention to work with the regions where it operates for the benefit of all Quebecers. It will do this by continuing to act through its regional offices, partner with stakeholders, and cooperate with local communities to ensure that its operations and projects blend in harmoniously with the host communities and contribute to their vitality.

In addition to generating significant economic benefits throughout the province, Hydro-Québec will continue to support numerous worthy causes in education, health care, and social or humanitarian aid.

## Appendix 1

# Follow-up to the *Strategic Plan 2000–2004*

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This document summarizes the activities carried out and results achieved in relation to the objectives set forth in the *Strategic Plan 2000–2004*. The left-hand column summarizes the major orientations and objectives pursued, while the right-hand column describes the activities that have been completed or are being carried out, as well as the results achieved.

## Human Resources: The Key to High-Quality Service and Growth

| ***Employee know-how*** | |
|---|---|
| Develop employees' technical, business and interpersonal skills, so as to ensure renewal of the work force and the continuity and development of know-how | Senior Management is currently studying a corporate plan to support the renewal of the work force.<br><br>A management succession plan is being implemented at TransÉnergie and plans are being developed at Hydro-Québec Production, Hydro-Québec Distribution and Hydro-Québec Ingénierie, approvisionnement et construction.<br><br>Succession plans for other designated employees are being deployed at TransÉnergie and Hydro-Québec Production. |
| Hire 1,500 employees, mostly recent graduates in strategic technical fields | Hydro-Québec must recruit more young people into its work force. To this end, it has established a long-term objective (2006) of meeting 40% of its succession needs through the hiring of recent graduates to fill positions as engineers, specialists, professionals and technicians. This goal still applies.<br><br>**Achievements**<br>In 2000: 487 people were hired, including 65 new graduates. |

| *Rallying employees* | |
|---|---|
| Implement a project to help all employees understand Hydro-Québec's issues and strategies | To ensure that all employees share a common understanding of the issues and challenges facing the company, Hydro-Québec developed and distributed two easy-to-understand learning maps:<br>• the first provides an overview of the company's business environment<br>• the second illustrates the company's financial reality and related issues<br><br>The objective of this operation is in line with efforts to rally employees around the orientations of the *Strategic Plan 2000–2004*, since an understanding of the "big picture" is essential to motivating them.<br><br>**Results**<br>16,736 employees participated in various presentations.<br><br>A Voice of Employees survey conducted in December 2000 showed, for employees who participated in the exercise:<br>• a 75% satisfaction rate<br>• a positive differential of 0.7 out of 10 on the employee motivation index<br><br>The learning maps had the greatest impact on the following employee expectations:<br>• clear, easy-to-understand information on the company's strategies<br>• communication with Senior Management<br>• efforts by Senior Management to promote a sense of belonging |
| Increase direct communication between managers and employees | All managers were involved in communicating the *Strategic Plan 2000–2004* directly to employees for whom they were responsible.<br><br>In addition, a number of managers were asked to present the learning maps and answer questions. |
| Adopt incentive compensation for all employees, tied to the company's annual results | The company's incentive plan calls for a maximum payment of 3% of base salary—tied to the performance of the company and its divisions—for all employees, except those with a specific variable-compensation plan.<br><br>Unionized employees receive a bonus based on achievement of the President and Chief Executive Officer's objectives, as approved by the Board of Directors. Non-unionized employees receive a bonus based on the results of their work unit.<br><br>**Bonuses paid for 2000**<br>Non-unionized employees: between 2.07% and 2.68%<br>Unionized employees: 2.07% |

# Serve Customers Better

## Orientation 1: Maintain rate stability

### *1.1 Confirm the rate freeze until 2002 and aim for rate stability thereafter*

| | |
|---|---|
| Maintain low, stable and uniform rates | The 1998 rates were maintained, allowing Québec customers to benefit from continued low rates at a time of rapidly rising fuel prices. Electricity prices remained stable in Québec, while prices for other energy sources were extremely volatile.<br><br>Moreover, the Québec government announced in 2001 that the rate freeze would be extended until April 2004. |
| Not propose any measures to modify the cross-subsidization of distribution service among the different rate categories | Hydro-Québec has not proposed any measures in this regard. |

### *1.2 Improve the company's efficiency*

| | |
|---|---|
| Keep annual operating expenses at $1.7 billion | Operating expenses reached $1.85 billion in 2000, representing a $150 million deviation from the objective. The increase reflected the company's desire to improve service quality and the reliability of power supply for all customers, which led to stepped-up regular maintenance and system enhancement activities. The additional funds were allocated without detracting from core activities or ongoing development with a view to seizing business opportunities. |
| Control non-income-generating investments, while ensuring the long-term operability of facilities:<br>• 1.2% in generation<br>• 1.3% in transmission<br>• 1.4% in distribution | As a percentage of the original value of fixed assets in operation, investments in long-term operability as at December 31, 2000 were as follows:<br>• 0.9% ($228 million) in generation<br>• 1.4% ($249 million) in transmission<br>• 2.0% ($160 million) in distribution<br><br>In generation, the variance is attributable to delays or postponements in maintenance projects, mainly with respect to major generating stations. In distribution, the increase in investments stems primarily from the fuse box replacement program, an increase in third-party requests and stepped-up asset maintenance activities aimed at improving the quality of service and reliability of the power supply. |

## Orientation 2: Improve service quality

### 2.1 *Improve service quality based on customers' priority expectations*

| | |
|---|---|
| Achieve a "very satisfied" rating among 50% of customers by 2004 and maintain the level of satisfied and very satisfied customers at 90% | Customer satisfaction held steady at 93% in 2000. The rate of "very satisfied" customers rose to 40% after dropping in 1999 due to service disruptions caused by a labor dispute. The target for 2000 was 39%. The improvement in the satisfaction rate continued during the first eight months of 2001, with 94% "satisfied," of whom 41% were "very satisfied."<br><br>Over the term of the *Strategic Plan 2002–2006*, this indicator will be monitored periodically, but will not constitute a target for Hydro-Québec. In fact, Hydro-Québec Distribution is aiming for improved satisfaction in terms of customers' expectations (customer satisfaction index). |
| Implement various measures to improve customer service | All service indicators have been improving since the beginning of 2000. With the establishment of a modern, efficient call centre, Hydro*Direct*, the percentage of calls answered in less than 20 seconds reached 66% as at August 31, 2001—5% higher than the target.<br><br>Hydro-Québec took steps to respect its commitments regarding scheduled service interruption notices, information on power outages, and the time required to perform various types of work.<br><br>Hydro-Québec set up one-stop access to its services—through a designated representative—for business customers with multiple sites (500 customers). The company also continued its quality partnerships with large-power customers (200 partnerships in 2000).<br><br>As well, Hydro-Québec started selling and installing heating systems for its residential customers, and the Régie de l'énergie approved its electrotechnology implementation support program, Phase II. Moreover, residential customers can now receive and pay their bills over the Internet. |
| Propose solutions to help customers who have difficulty paying their bills | A task force comprising representatives of 40 consumer organizations met about 20 times to seek sustainable solutions to assist lower-income customers. A review of business practices related to payment arrangements was also conducted. |
| Adopt energy efficiency measures | After assessing the energy conservation potential with the Agence de l'efficacité énergétique, Hydro-Québec started developing an overall energy efficiency plan, which must be submitted to the Régie de l'énergie in 2002 (see Appendix 3). |

## 2.2 *Improve the reliability of power supply for all customers*

| | |
|---|---|
| From 2000 to 2004, lower the average duration of service interruptions to 2.35 hours per customer and to 1.3 hours in urban areas | The service average interruption duration index for the transmission and distribution systems reached 2.33 hours per customer in 2000, a 17% improvement over 1999. |
| Make investments to strengthen the power system:<br>• $175 million in distribution<br>• $620 million in transmission | As at June 30, 2001, cumulative investments in distribution were $62 million. The forecast of $175 million will be achieved in 2002. The distribution system has been reinforced in high-risk areas of the Richelieu, Montmorency and Northeast regions.<br><br>Investments in transmission system looping and reinforcement reached $334 million in June 2001. The loops serving downtown Montréal and the Québec-Mauricie corridor were completed. The Montérégie loop is still awaiting the Québec government's decision following the tabling of the Bureau d'audiences publiques sur l'environnement (BAPE) report. Hydro-Québec has held discussions with community organizations, and the government authorization process is proceeding. As for the loop project in the Outaouais region, following the tabling of the BAPE report, the Minister of the Environment and the Minister of Natural Resources stated that the Grand-Brûlé–Vignan transmission line project would not be authorized by the Québec government. |
| Implement a program for the undergrounding of distribution lines in urban areas | In November 2000, Hydro-Québec informed the municipalities about its Power Line Undergrounding program for the distribution system. This program targets the enhancement of heritage sites, public roads and new residential neighborhoods.<br><br>In July 2001, the Québec government introduced a program to underground distribution lines in heritage, cultural and tourist sites. Under this program, Hydro-Québec will contribute up to $200 million over a four-year period (July 2001 to July 2005). This program replaces the one outlined in the *Strategic Plan 2000–2004*. The Ministère des Ressources naturelles has mandated Hydro-Québec to carry out the studies and work related to system undergrounding. |
| Offer business customers "à la carte" products (with regard to power quality, for example) subject to the payment of corresponding fees | This strategy was reviewed in light of customer needs and a benchmarking analysis. Hydro-Québec offers technical support to customers experiencing difficulties with power quality and can intervene to correct certain critical situations at the customer's premises. Two pilot projects are under way in the Laurentides region to evaluate the performance of technologies designed to improve power quality. |

## 2.3 *Ensure security of supply for Québec customers, at competitive conditions*

| | |
|---|---|
| Additional sales in Québec of 17.4 TWh compared with 1999:<br>• 7.0 TWh – small- and medium-power markets<br>• 10.4 TWh – large-power market | At the end of 2000, sales to small- and medium-power markets were up 1.4 TWh from the forecasts of the *Strategic Plan 2000–2004*. Sustained growth in sales to the small- and medium-power industry and the commercial sector accounted for this increase.<br><br>At the end of 2000, sales to large-power customers exceeded the *Strategic Plan 2000–2004* forecast by 0.5 TWh. |
| Short-term purchase-resale transactions | The establishment of an energy trading floor allowed Hydro-Québec to conduct profitable price arbitraging transactions on foreign markets. |
| Maintenance of short-term management criteria | Hydro-Québec reconfirmed its short-term energy and power management criteria: maintain a sufficient energy reserve to cover a possible 64-TWh runoff deficit over two consecutive years, and a capacity reserve equivalent to 10%–12% of firm demand. |
| 4-TWh increase in generation by 2004:<br>• 3 TWh: Sainte-Marguerite-3 and the new Grand-Mère generating station<br>• 0.9 TWh: partial diversion of rivers | Sainte-Marguerite-3 generating station is scheduled for commissioning in 2001 and the new Grand-Mère station will be commissioned in 2004. As well, partial diversion projects, including those involving the Betsiamites watershed, are undergoing the normal environmental review and approval process. |

## 2.3 Ensure security of supply for Québec customers, at competitive conditions (cont.)

| | |
|---|---|
| Authorized purchases from independent power producers | Following the adoption, in June 2000, of the *Act to amend the Act respecting the Régie de l'énergie*, Hydro-Québec Distribution was given responsibility for the security of the power supply to Québec customers. The Québec government is expected to issue an order-in-council defining the characteristics of heritage pool electricity. The Régie de l'énergie approved Hydro-Québec Distribution's code of ethics and tendering procedure for electricity suppliers.<br><br>The Québec government issued an order-in-council to establish the content and frequency of Hydro-Québec Distribution's Electricity Supply Plan. The first Electricity Supply Plan must be tabled by November 1, 2001. The Régie de l'énergie's decision on electricity transmission rates is expected for early 2002.<br><br>At the request of the Québec government, the Régie de l'énergie issued opinions concerning independent production and the development of new forms of energy.<br><br>The Régie de l'énergie recommends developing 450 MW of wind power over a nine-year period, a project that must be approved by the Québec government. As for small hydroelectric generating stations, the Régie recommends developing 150 MW. In 2001, the Ministère des Ressources naturelles issued a policy for the allocation of hydroelectric sites of 50 MW or less. This policy stipulates that any excess electricity produced by small generating stations beyond their own consumption needs will have to be sold to Hydro-Québec Production. |
| Access to competitive resources outside Québec | To improve the management of interconnections and keep downtime to a minimum, Hydro-Québec set up two processes. The purpose of this pilot project is to make interconnections available when needed by customers and to do maintenance work on them when they are not needed. This involves the short-term planning of transmission equipment withdrawals that have an impact on interconnection capacities, and the short-term postponement or early withdrawal of equipment by customers.<br><br>In view of the time needed for Hydro One to obtain a licence in Ontario, the new interconnection may only be commissioned in 2005. As well, Hydro-Québec has applied to the Federal Energy Regulatory Commission for reciprocal, non-discriminatory open access to the Québec–Massachusetts wheeling capacity. |

# Ensure the Company's Profitable Growth in Québec

## Orientation 3: Continue to develop profitable hydroelectric potential

### *3.1 Complete the development of profitable hydroelectric potential*

Ensure additional generation and supply under competitive terms

Negotiations for the purchase of electricity that would be produced at Gull Island generating station in Labrador should resume in the fall of 2001.

A proposal was made concerning the Eastmain-1 generating station project. Hydro-Québec is awaiting a response to the proposal from the Grand Council of the Crees.

Provincial authorization for the Toulnustouc generating station project was issued in June 2001. Federal authorization is expected in November 2001.

Other projects now being studied could add between 5 and 6 TWh to the company's generating capability after 2006.

| ***3.2 Be proactive in communicating the environmental benefits of hydroelectricity and Hydro-Québec's environmental performance*** | |
|---|---|
| Promote hydroelectricity as a renewable energy that reduces greenhouse gases | The company's environmental communication plan called for the preparation and distribution of technical data sheets showing an environmental comparison of various means of generation as well as information on climate change. In addition, a map showing the movement of atmospheric pollutants in North America was disseminated. |
| Use the Internet to promote Hydro-Québec's environmental management | Following a review of its content and visual presentation, Hydro-Québec's environment Web site received 21,000 hits from outside users between January 1 and August 20, 2001. Among other things, visitors were informed about the implementation of the ISO 14001 standard.<br><br>In 1997, Hydro-Québec started deploying an environmental management system that complies with ISO 14001. In 2000 and 2001, three of the company's operating segments completed the registration phase: operation of generating facilities, the distribution system, and certain supply and services areas. TransÉnergie and the remainder of Hydro-Québec's strategic areas will obtain their ISO 14001 registration in 2002. |
| Create the Fondation Hydro-Québec pour l'environnement | Launched on March 1, 2001 with the participation of over 80 environmental groups from the various regions of Québec, the Foundation received 86 applications for financial support in 2001. Given the budget available for the year ($375,000), 14 projects were selected and will receive amounts ranging from $1,400 to $100,000. |

## Orientation 4: Stimulate technological innovation within the company

### 4.1 Focus RD efforts on the company's strategic sectors, products and services

| | |
|---|---|
| Concentrate efforts in nine research areas and maintain the budget at $100 million | With the goal of optimizing the management of innovation project portfolios, certain major themes were defined and others added, to bring the divisions' needs into sharper focus.<br><br>Investments in technological innovation for 2001 amounted to $104 million, including prospective research expenses estimated at $12 million. |
| **9 major research themes**<br><br>*Generation*<br>• Develop new concepts for the construction of facilities<br>• Increase the life span of facilities by 10%<br>• Improve the energy capability of generating facilities by 1%<br><br>*Transmission*<br>• Increase the life span of equipment<br>• Increase system capacity<br>• Reduce the impact of major weather events by 50% | ***Generation—Total: $26.21 million***<br>1. Develop new concepts for the construction of facilities: $1.65 million<br>2. Increase the life span of facilities by 10%: $10.64 million (long-term operability of dams and structures)<br>3. Improve the energy capability of generating facilities by 1% : $5.97 million<br><br>Technical intelligence: $0.75 million<br><br>Expertise and technical support and other activities: $7.20 million<br><br>***Transmission—Total: $28.07 million***<br>4. Increase the life span of facilities: $7.20 million (including a reduction in the cost of new lines and substations)<br>5. Increase system capacity: $5.30 million (including optimized management of the transmission system in the context of market opening)<br>6. Reduce the impact of major weather events by 50%: $3.90 million<br><br>Other projects: $3.20 million<br><br>Technical intelligence: $1.20 million<br><br>Expertise and technical support and other activities: $7.27 million |

## 4.1 Focus RD efforts on the company's strategic sectors, products and services *(cont.)*

***Distribution and Customers***

- Lower the cost of underground lines by 50%
- Increase the life span of equipment by 10%
- Improve energy efficiency

***Distribution—Total: $25.17 million***

7. Lower the cost of underground lines by 50%: $5 million
8. Increase the life span of facilities by 10%: $13.34 million (including improving power quality and reducing the cost of the overhead system)

Technical intelligence: $0.6 million

Expertise and technical support and other activities: $6.23 million

***Customers—Total: $12.54 million***

9. Develop new profitable sales, while promoting the efficient use of energy: $4.04 million
   Reduce the distributor's supply cost: $0.8 million
   Increase the satisfaction of residential customers: $0.5 million

Technical intelligence: $0.2 million

Expertise and technical support: $7 million

## 4.2 *Use the gains achieved through innovation to benefit Hydro-Québec's core activities*

Manage the technological innovation cycle on an integrated basis and focus on the challenges of the business units

The new integrated technological innovation management process was implemented in 2001.

This new method is explained in detail in Appendix 2.

Main parameters of this approach:

- Process incorporating all steps of the innovation process, from idea to implementation, while considering the commercial potential and economic benefits
- Choice of projects with a decisive impact on the company's core activities
- Careful management of project portfolios to achieve a balance between the short, medium and long terms
- Rigorous management of projects (cost tracking, lead times, technical feasibility, commercial evaluation and financial outlook)
- Triannual accountability to Senior Management

Main achievements in 2001:

- Establishment of five platform teams (Generation, Transmission, Distribution, Customer Service, Crossfunctional)
- Establishment of five project portfolios comprising a total of 65 major projects in line with the research themes selected
- Implementation of a "stage gate" project management process and the supporting management information system
- Internal reorganization of the Direction principale – Recherche et développement
- Accountability to Senior Management

| 4.3 Reposition the company's venture capital operations | |
|---|---|
| Position the company as a key player on the global research information circuit | Investments in three U.S. venture capital funds and a European fund helped expand Hydro-Québec CapiTech's business network and pinpoint direct investment opportunities. Investment partners are selected based on their ability to share information about business opportunities and technological developments. |
| Invest $100 million through Hydro-Québec CapiTech:<br>• 30% in international funds<br>• 70% in direct investments | As at September 30, 2001, investments in technological venture capital were as follows:<br>• 30% in international funds<br>• 70% in direct investments<br>This breakdown concerns only Hydro-Québec CapiTech's investments. |
| Aim for a return on equity of 20% for the overall fund | Until 2004, when it is expected to dispose of its first fund ($108 million) in its entirety, Hydro-Québec CapiTech will continue to aim for a 20% return on equity. |

## Seize Business Opportunities

### Orientation 5: Participate in the development of the North American electricity industry

| 5.1 Focus development projects in North America on high-voltage transmission | |
|---|---|
| Participate in the development and application of new technologies designed to reduce congestion in certain transmission corridors | TransÉnergie U.S. obtained authorization from the FERC to sell capacity on the transmission line it will build between Long Island, N.Y., and Connecticut. This is a 41-km direct-current underwater connection known as the Cross Sound Cable. TransÉnergie U.S. is awaiting a construction permit from the regulatory body of the State of Connecticut. It has also submitted a proposal for Cross Sound Cable II and initiated technical and market studies in connection with various projects. |

## Orientation 6: Participate in the development of the North American gas industry

### 6.1 *Maintain development focus on current sectors: energy transportation and natural gas distribution*

| | |
|---|---|
| Support the strategic development of Gaz Métropolitain and Enbridge through Noverco | Through its representatives on the boards of directors of Gaz Métropolitain and Enbridge, Hydro-Québec has supported these companies' efforts to ensure that Québec natural gas consumers have access to various production sources in Canada (east and west coasts) and the United States.<br><br>The company is closely monitoring the development and implementation of distributed generation technologies. Along with Gaz Métropolitain, it participates in customer demonstrations of a cogeneration microturbine operated alongside Hydro-Québec's distribution system. |

### 6.2 *Develop a program of complementary investments in the gas industry*

| | |
|---|---|
| Seize complementary investment opportunities in the North American gas industry, particularly in the upstream sector on the periphery of Québec | Exploration studies were carried out, with the following conclusions:<br>• Hydro-Québec is not in a position to influence the upstream sector on Canada's east coast.<br>• The royalties from natural gas production in Québec would be a promising source of additional revenue for the province.<br>• This is an area in which capital investments are very high and very risky.<br><br>Furthermore, the profitability of such investment projects is compromised by the extreme volatility of gas prices, which was particularly evident over the last year.<br><br>No complementary investment plan in the upstream sector was carried out. |
| Support studies dealing with Québec's gas-producing potential | Hydro-Québec proposed consolidating and validating existing studies and data, in light of the potential interest of certain less-explored areas (Gulf of St. Lawrence and its estuary). |

## Orientation 7: Continue international development

### *7.1 Focus international activities on areas in which the company has a high level of expertise and fine-tune the business partnership approach*

| | |
|---|---|
| Focus international activities on hydropower construction and management and high-voltage transmission | Hydro-Québec reorganized its international operations. Each division is now responsible for international projects in its particular sphere of activity.<br><br>In transmission, Hydro-Québec acquired the transmission assets of Transelec in Chile.<br><br>In September 2000, the company completed the commissioning of the DirectLink project in Australia. This project involved the building of a 180-MW interconnection between New South Wales and Queensland.<br><br>In October 2000, the company commissioned a 600-km, 200-kV interconnection in Peru. This line, which uses series compensation, was built by Hydro-Québec, which will also operate and maintain it for 30 years.<br><br>For all international energy transmission activities, TransÉnergie acts as Hydro-Québec's representative before the Board of Directors and is responsible for operations.<br><br>International growth prospects for the term of the *Strategic Plan 2002–2006* are limited to areas in which Hydro-Québec has a high level of expertise: hydropower generation with trading potential, and high-voltage transmission, mainly in Chile (Transelec assets) and the United States (projects to reduce system congestion). |
| Operate through business partnerships established, first and foremost, with Québec companies and in which Hydro-Québec can both invest and act as an industrial operator | In generation, Hydro-Québec joined forces with The IT Group, which owns Québec-based Groupe Roche, to offer operation and maintenance management services for hydroelectric facilities in the United States.<br><br>The company is also participating, in partnership with SNC-Lavalin, in the Murraylink project in Australia. This project involves the construction of a 200-MW, 180-km interconnection between the states of Victoria and South Australia. |

### *7.2 Aim for an average return on equity of 15%*

| | |
|---|---|
| Limit international investments to a level that does not affect the stability of Hydro-Québec's cash flows | The projects carried out meet the established performance criteria, based on their risk/return profile. The level of investment did not have a significant impact on the company's cash flow. |

# Financial and Economic Outlook

## Consolidated Results

Hydro-Québec's consolidated net income totaled $1,078 million in 2000 and should reach $1,025 million for 2001. This performance exceeds the target set in the *Strategic Plan 2000–2004* by $128 million, mainly on the strength of higher sales outside Québec compared with Plan forecasts and on lower-than-expected financial expenses in 2000.

***Consolidated Results** ($ millions)*

| | 2000 | | | 2001 | | |
|---|---|---|---|---|---|---|
| | ***Strategic Plan 2000–2004*** | **Actual** | **Impact on income** | ***Strategic Plan 2000–2004*** | **Estimate** | **Impact on income** |
| Revenue | 9,715[1] | 11,429 | 1,714 | 10,274[1] | 12,485 | 2,211 |
| Operating expenses | 1,925 | 2,135 | (210) | 1,915 | 2,110 | (195) |
| *- excluding subsidiaries and holdings* | *1,691* | *1,848* | *(157)* | *1,696* | *1,810* | *(114)* |
| Other expenses | 3,384[1] | 4,829 | (1,445) | 4,012[1] | 5,943 | (1,931) |
| Financial expenses | 3,443[1] | 3,369 | 74 | 3,308[1] | 3,390 | (82) |
| Non-controlling interest | 13 | 18 | (5) | 14 | 17 | (3) |
| **Consolidated net income** | **950** | **1,078** | **128** | **1,025** | **1,025** | **–** |
| Return on equity (%) | 6.8 | 7.7 | 0.9 | 7.1 | 7.1 | – |
| Interest coverage | 1.27 | 1.37 | 0.10 | 1.34 | 1.42 | 0.08 |
| Average cost of debt (%) | 9.1 | 8.8 | 0.3 | 8.9 | 8.7 | 0.2 |
| Capitalization (%) | 27.0 | 26.2 | (0.8) | 28.2 | 26.9 | (1.3) |

*1. Reclassification.*

## Revenue

North American economic growth, which continued for the fourth straight year in 2000, had a favorable impact on sales, pushing revenue up $1,714 million past the forecast level.

Despite unusually mild temperatures, the volume of electricity sales in Québec rose 3.9% in 2000, to a level exceeding the Plan forecast by 2 TWh or $110 million. The growth was driven mainly by business and large-power customers, while residential sales growth was slowed by the negative impact of weather conditions. The upsurge in fuel prices also had a hand in the growth of sales to business customers, as those with dual-energy systems tended to rely more on electric power. For 2001, even though energy markets are generally more favorable than forecast in the *Strategic Plan 2000–2004*, the economic slowdown will prevent the company from achieving its target for large-power sales.

Price hikes, combined with the strengthening of Hydro-Québec's purchase-resale strategy on the North American spot market, enabled revenue from electricity sales outside Québec to exceed the forecast by $1,420 million. One factor underlying this impressive performance is the creation of new regional power exchanges that allow the company to conduct short-term electricity sale and purchase transactions in real time. As well, in May 2000, Hydro-Québec set up a trading floor, in order to participate in electricity futures markets beyond the levels forecast in the *Strategic Plan 2000–2004*. There should be a significant positive differential in 2001, since we are continuing our purchase-resale strategy on the North American spot market.

Natural gas sales in 2000 were also up by $220 million compared with forecasts, owing largely to growth in revenue from Noverco. Most of this growth and some of the 2001 growth stems from the recording of 50% of Noverco's results, instead of 41%. The increase in natural gas prices explains the fact that sales in 2001 were almost $250 million higher than forecast in the *Strategic Plan 2000–2004*.

Other revenue from operations also rose by nearly $200 million in 2001, spurred mainly by the late-2000 acquisition of Transelec, the largest power transmission company in Chile, which had not been forecast in the *Strategic Plan 2000–2004*.

## Operating Expenses

In 2000, the company's operating expenses surpassed the *Strategic Plan 2000–2004* forecast by $210 million, including $53 million attributable to holdings.

The desire to improve the quality and reliability of electricity service for all customers led the company to step up its regular maintenance activities beyond the anticipated levels. These efforts helped improve customer satisfaction and reduce the average duration of service interruptions beyond the target of the *Strategic Plan 2000–2004*.

In 2001, the budgets for Hydro-Québec Production, TransÉnergie and Hydro-Québec Distribution were increased in order to improve the performance of core activities. Hydro-Québec will continue to improve the quality of its customer service, primarily in the following areas:

- optimization of customer reception activities and after-sales service
- improved customer service before and during scheduled outages
- continued development of e-commerce

Operating expenses of holdings exceeded forecasts in 2000 and 2001 mainly due to Noverco's results being recorded at 50% instead of 41%. In 2001, the consolidation of Transelec and the accelerated marketing plan for Avestor (a joint venture whose mission is to commercialize the lithium-metal-polymer battery) contributed to these higher-than-forecast expenses.

## Other Expenses

More robust activity on North American markets led to increases in short-term electricity purchases of $1,200 million and $1,350 million for 2000 and 2001, respectively, in comparison with the *Strategic Plan 2000–2004* forecasts.

Once again, the new method of accounting for Noverco's results is the reason why gas purchases exceeded forecasts by about $100 million per year. The figures also reflect an increase in the price of natural gas, amounting to about $250 million.

Fuel purchases also rose by $90 million in 2001 following the commissioning of a gas-fired thermal generating station in the United States.

Taxes showed a positive differential of $110 million in 2000 compared with the *Strategic Plan 2000–2004* forecast. In May 2000, a technical amendment announced in the Québec provincial budget changed the basis for calculating capital tax. This measure, which applies retroactively, is largely responsible for the forecast differential.

Depreciation, amortization and decommissioning expenses exceeded the *Strategic Plan 2000–2004* forecast by about $110 million in 2000 and $60 million in 2001. This was largely as a result of the amortization of major projects that were abandoned or postponed, and the write-off of other projects, including the Lower Churchill hydroelectric development. In 2001, the difference was also due to the depreciation of the Transelec assets acquired in Chile.

## Financial Expenses

Financial expenses were $74 million less than forecast for 2000 and $82 million more than forecast for 2001.

In 2000, the positive differential resulted from the repayment of maturing debt using cash from operations and the early redemption of debt financed at lower-than-expected rates.

In 2001, financial expenses exceeded the forecast largely due to a higher-than-expected exchange loss, resulting from a forecast exchange rate of 4.6¢ below the *Strategic Plan 2000–2004* forecast, well as the addition of financial expenses for the acquisition of Transelec.

## Investments

***Investments*** *($ millions)*

| | 2000 | | | 2001 | | |
|---|---|---|---|---|---|---|
| | *Strategic Plan 2000–2004* | Actual | Difference | *Strategic Plan 2000–2004* | Estimate | Difference |
| Hydro-Québec investments | 2,225 | 2,312 | 87 | 2,182 | 1,984 | (198) |
| Investments by holdings and others | 46 | 1,251 | 1,205 | 55 | 76 | 21 |
| **Total investments** | **2,271** | **3,563** | **1,292** | **2,237** | **2,060** | **(177)** |

Hydro-Québec's investments for 2000 were $87 million higher than forecast in the *Strategic Plan 2000–2004*. This was mainly attributable to

- an unanticipated injection of capital for the Transelec acquisition
- delays or postponements in projects for the refurbishing or upgrading of generating stations, including Grand-Mère and Beauharnois
- postponements and reduced costs for the Sainte-Marguerite-3 project

- delays in the Montérégie and Outaouais loop projects
- repositioning of the Lower Churchill project
- delays and postponements of development projects, including Eastmain-1, which includes the partial diversion of the Rupert River

The amounts under the heading *Investments by holdings and others* for 2000 surpassed the Plan forecast by $1,205 million, mainly as a result of the Transelec acquisition.

In 2001, Hydro-Québec's investments should be $198 million below the Plan forecast, mainly due to delays in certain loop projects and in the Ontario interconnection project.

## Financing

***Financing*** *($ millions)*

| | 2000 | | | 2001 | | |
|---|---|---|---|---|---|---|
| | ***Strategic Plan 2000–2004*** | **Actual** | **Difference** | ***Strategic Plan 2000–2004*** | **Estimate** | **Difference** |
| Issues | 2,084 | 2,200 | 116 | 3,060 | 4,312 | 1,252 |
| Less redemptions | 2,454 | 3,054 | 600 | 3,442 | 3,363 | (79) |
| **Total** | **(370)** | **(854)** | **–** | **(382)** | **949** | **–** |

In 2000, despite early redemptions that were not included in the *Strategic Plan 2000–2004* and investments that overshot the forecast by more than $1,200 million, Hydro-Québec did not substantially increase its issues of long-term debt. In fact, cash from operations exceeded forecasts and the company used temporary short-term financing to bankroll the acquisition of Transelec.

In 2001, despite lower-than-forecast investments and redemptions, the company should issue more long-term debt than forecast in order to finance the Transelec acquisition over the long term. The acquisition was covered by temporary, short-term financing at the end of 2000.

***Main Economic Parameters***

| | 2000 | | | 2001 | | |
|---|---|---|---|---|---|---|
| | *Strategic Plan 2000–2004* | Actual | Difference | *Strategic Plan 2000–2004* | Estimate | Difference |
| Canadian CPI (% change) | 1.6 | 2.7 | 1.1 | 1.8 | 2.4 | 0.6 |
| Price of aluminum (US¢/pound) | 63.1 | 74.6 | 11.5 | 68.0 | 70.3 | 2.3 |
| Value of C$ against US$ | 0.666 | 0.673 | 0.007 | 0.695 | 0.649 | (0.046) |
| Interest rates on 90-day T-bills (%) | | | | | | |
| - Canadian market | 4.6 | 5.5 | 0.9 | 4.9 | 4.4 | (0.5) |
| - U.S. market | 4.4 | 5.8 | 1.4 | 4.6 | 3.8 | (0.8) |
| Interest rate on 10-year Hydro-Québec bonds (%) | | | | | | |
| - Canadian market | 5.7 | 6.5 | 0.8 | 5.9 | 6.3 | 0.4 |
| - U.S. market | 5.9 | 7.3 | 1.4 | 6.0 | 6.4 | 0.4 |

## Economic Impact

Hydro-Québec makes a significant contribution to the Québec economy through its purchases of goods and services, its payment of taxes and loan guarantee fees, and the dividends it pays to its shareholder, the Québec government.

Thus, in 2000, the company paid $453 million in dividends and $186 million in loan guarantee fees, as well as $525 million in taxes to the provincial and municipal governments.

In 2000, Hydro-Québec's presence in all regions of Québec resulted in the purchase of goods and services worth $1.5 billion, or 94% of all its purchases. Jobs sustained among suppliers associated directly or indirectly with these purchases were estimated at 10,400 person-years. Overall, the jobs sustained by Hydro-Québec's investments and operations met the targets for 2000 and 2001.

## Appendix 2

# Technological Innovation

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*Improving the performance of the company's core operations* ..... *121*

*Consolidating integrated innovation management* ..... *123*

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## The Company's Long-Term Performance and Viability

Hydro-Québec is a technology-driven company. The energy it produces plays a vital role in people's lives and the economy—not just satisfying basic needs, but also supporting state-of-the-art technologies such as IT and telecommunications. As electricity increases in importance in coming years, technological innovations relating to this valuable, efficient and clean energy source will lead to the development of an ever-increasing number of high-performance processes and products for industrial, business and domestic applications. To maintain its leadership in this fast-changing context, Hydro-Québec will continue to innovate with a view to improving its performance and ensuring its long-term viability. The company intends to capitalize on its world-renowned expertise in large transmission systems and hydroelectric complexes, as well as on R&D initiatives that are gaining recognition on the international scene, such as the lithium-metal-polymer battery. It will also build on the strengths of its two world-class research facilities, IREQ and LTEE (its electrochemical and electrotechnologies laboratory), and on a long tradition of substantial R&D investments spanning over 30 years.

Each year, RE$EARCH Infosource publishes a list of Canada's top corporate R&D spenders. In 2000, Hydro-Québec ranked among the 15 firms in the elite $100 Million Club, having spent over $100 million in the area of technological innovation. Among the companies that made the cut, only two are government-owned or controlled: Hydro-Québec and Atomic Energy of Canada Limited.

**The $100 Million Club**

| Rank | Company | Industry |
|---|---|---|
| 1 | Nortel Networks | Comm/telecom equipment |
| 2 | Pratt & Whitney | Aerospace |
| 3 | Magna International | Automotive |
| 4 | Ericsson Canada | Comm/telecom equipment |
| 5 | ATI Technologies | Computer equipment |
| 6 | PMC-Sierra | Electronic parts and components |
| 7 | Atomic Energy of Canada Limited | Energy |
| 8 | JDS Uniphase | Comm/telecom equipment |
| 9 | Mitel Corporation | Comm/telecom equipment |
| 10 | Bombardier | Aerospace |
| 11 | CAE | Aerospace |
| 12 | GEAC Computer Corporation | Software and computer services |
| 13 | Alcan | Mining and metals |
| 14 | Apotex | Pharmaceuticals/biotechnology |
| 15 | Hydro-Québec | Electric power and utilities |

*Source: RESEARCH Infosource.*

In a similar analysis of R&D expenditures by industry sector, electrical products and power utilities ranked 13th and 14th respectively, lagging far behind the telecommunications, aerospace, medical and pharmaceutical sectors. It should also be noted that Hydro-Québec accounted for approximately 60% of the $170 million invested in R&D by Canadian utilities in each of 2000 and 2001.

Most electric utilities have never had their own research centres or have disposed of them. Among those who operate such facilities today, Hydro-Québec occupies an enviable position, alongside such thriving Japanese companies as Kansai Electric Power Company (Kepco), Tokyo Electric Power Company (Tepco) and Chubu Electric Power Company, which invest approximately 1% of their gross annual sales in R&D.

Given the profound changes it has experienced in recent years, the entire electricity industry is currently reviewing its R&D activities. The goal is to bring R&D in line with utilities' new business priorities.

One emerging trend is a segmentation of R&D efforts among different types of players. Equipment manufacturers specialize in the development of power system components, while electric utilities focus on system and equipment management and process improvement. Companies backed by venture capitalists tend to concentrate on specific niche markets. In light of the sharp decline in the dot.com and IT markets, many venture capital managers now view the energy industry as highly promising. A study released by the U.S. venture capital firm Nth Power Technologies Fund I revealed that in 2000, over $1 billion in risk capital was invested in the energy sector.

## Improving the performance of the company's core operations

Hydro-Québec's economic performance hinges to a large extent on technological innovation. For this reason, the company intends to maximize returns on the extraordinary R&D capabilities it has developed over the years by focusing efforts on its core competencies and strategic areas of interest. This approach will allow it to meet the needs of its various divisions and thereby provide better service to customers.

The company has developed a number of innovation themes based on the divisions' priority needs. For each theme, ambitious goals have been set which represent significant challenges for the scientific community and should give rise to major technological breakthroughs. While Hydro-Québec does not necessarily expect to achieve all of these goals, they will have an impact on technological leadership within the company and act as a stimulus for the various divisions.

## *Technological Innovation Themes*

| Division | |
|---|---|
| **Hydro-Québec Distribution** | • Improve the quality of electricity service<br>- Reduce the service average interruption duration per customer to 2.35 hours per year<br>- Improve the system's resistance to extreme weather conditions (ice storms)<br>- Provide power quality that complies with international standards<br>• Reduce underground system costs<br>- Reduce the cost of the existing underground system by 10%<br>- Reduce the cost of new underground lines (i.e., extensions into medium-density areas) by 50%<br>- Reduce the cost of undergrounding overhead lines by 25%<br>• Reduce the cost of the overhead system by 10%<br>• Develop profitable new sales while promoting the efficient use of energy<br>• Lower the distributor's supply cost<br>• Increase the satisfaction of residential customers<br>• Maintain sales in commercial and institutional markets which are subject to competition, with a view to profitability |
| **TransÉnergie** | • Increase the useful life of certain types of equipment by 10% and lower maintenance costs for designated equipment by 10%<br>• Reduce the cost of building new lines and substations by 10%<br>• Increase the capacity of designated corridors by 33%<br>• Optimize transmission system management<br>• Reduce the impact of extreme weather conditions by 50% |
| **Hydro-Québec Production** | • Performance and long-term operability of generating units as well as electrical and mechanical equipment: increase useful life by 10%, availability by 1%, and efficiency by 0.5%<br>• Profitability of generating assets: increase energy capability by 0.5%<br>• Long-term operability of dams and other structures: increase useful life by 10%<br>• New methods for the construction of large-scale facilities: cut construction costs by 10% and reduce construction lead times by one year |

The company's technological innovation projects have been realigned as a function of these major themes, with a special emphasis on creating value. Top priority was given to projects with the greatest economic benefits, whether in the form of additional sales, cost savings, productivity

increases or deferred investments. By refocusing projects in this way, it was possible to bring their number down from 431 in 1999 to 65 in 2001. This exercise involved enlarging the scope and scale of each initiative, resulting in a more substantial project portfolio.

To take advantage of the best possible solutions, Hydro-Québec has adopted a flexible approach. Under this policy, solutions can be developed either in-house by the company's experts, or by external parties who have the necessary expertise. Hydro-Québec also favors cooperative arrangements and partnerships as a means of acquiring the full range of know-how and resources needed to carry out innovation projects.

Furthermore, to ensure that it reaps all the expected benefits from a given project, the company has introduced a complete tracking cycle that now extends beyond the R&D phase to include commercial development and the implementation of technological solutions.

## Consolidating integrated innovation management

Like all large innovative companies, Hydro-Québec considers innovation—R&D first and foremost, but also the business development, manufacturing and implementation of new products—as being critical to its performance and success.

- **Scientific and technological innovation may be considered as the transformation of an idea into a new or improved product introduced on the market [...]**
- **Technical innovations comprise new products and processes and significant technological changes in products and processes. An innovation has been implemented if it has been introduced on the market (product innovation) or used within a production process (process innovation). Innovations therefore involve a series of scientific, technological, organizational, financial and commercial activities.**
- **R&D is only one of these activities and may be carried out at different phases of the innovation process, acting not only as the original source of inventive ideas but also as a form of problem-solving which can be called on at any point up to implementation.**

Source: OECD, *Main Definitions and Conventions for the Measurement of Research and Experimental Development (R&D)*, Paris, 1994.

Accordingly, the company has implemented an integrated innovation management program allowing all the parties involved—researchers, users, business specialists and external partners alike—to interact throughout the process, contributing their respective expertise to each phase of a given project.

This program calls for rigorous, systematic management of the overall project portfolio and of individual project teams, budgets and schedules. Assessment of the technical and scientific merits of proposed solutions, as well as their potential benefits and technical feasibility, has also been reinforced. By focusing on commercialization and involving venture capitalists in the process, the program makes it possible to speed up evaluation of proposals, including their sales potential and financial prospects. Moreover, the buy-in of Hydro-Québec's business divisions and external partners makes it easier to implement and market new technologies.

Under the new integrated management program, the marketability of an innovation is taken into account very early in the evaluation process. R&D projects are analyzed to determine what economic benefits could be derived from the resulting product or process. Then, at the pre-startup phase, business plans are developed to confirm the project's market potential.

Commercialization of an innovation involves issuing a marketing licence to a company already active in the target market, or creating a spinoff if Hydro-Québec can find partners that are well positioned to penetrate the market and also willing to invest in the venture. However, no commercialization will be undertaken if the innovation will give Hydro-Québec a competitive edge in its primary markets.

The R&D component of innovation projects remains central to Hydro-Québec's activities, accounting for approximately $60 million a year in spending. Following is a description of some major projects that are already generating substantial benefits for the company.

## Hydro-Québec Distribution

### *An integrated heating and ventilation system*

This combined heating and ventilation system, which can also double as an air-conditioning unit, offers the two main advantages of baseboard heaters. First, it provides for a different heat setting in each room, since individual units are controlled by electronic thermostats. Second, decentralization reduces the volume of air being displaced, and hence the noise generated by the system. Hydro-Québec markets this product through its HydroSolution subsidiary.

### *A remote-operated overhead line switch*

Hydro-Québec and IATS, a French manufacturer of overhead line switches, recently signed an agreement to manufacture and market a remote-operated vacuum switch for overhead distribution lines. IATS, Hydro-Québec's research institute (IREQ) and Hydro-Québec Distribution worked in close collaboration to develop the product, which can be used on most of Hydro-Québec's distribution lines. The switch meets the company's criteria for ice loading strength, since the cutout is encased in a hermetically sealed, weatherproof enclosure. Other advantages include fewer service interruptions and improved service continuity for customers. Hydro-Québec has already purchased 75 such switches and will be acquiring more as part of its program to strengthen and automate its distribution system.

## TransÉnergie

### *Vibroacoustic monitoring of power transformers*

A portable vibroacoustic detector is being developed to monitor the state of power transformers and detect any anomalies in their operation. The unit works like a stethoscope, detecting mechanical or electrical defects based on the sounds emitted while the transformer is in service. Moreover, problems can be diagnosed before they have any impact

on customers. Development efforts are now being pursued as part of a larger innovation project focusing on tools to assess the condition and determine the remaining useful life of power transformers and shunt reactors. The project's present net value is $15 million.

### *Power system simulator*

For many years now, TransÉnergie has been using a system simulator and related expertise to test system behavior when new equipment is brought into service. In addition, various controls and protection mechanisms on large- or medium-scale transmission systems can be tested. This simulator gives TransÉnergie a major competitive advantage on international markets.

## Hydro-Québec Production

### *MATH*

As part of a project called MATH (a French acronym for "hydraulic turbine analysis model"), launched in 1989, digital simulation tools were developed to gain a better understanding of the mechanics of hydraulic turbines. Using these tools, the project team altered the design of one turbine at La Grande-3 generating station in 1998. Efficiency measurements taken before and after the modification revealed a 1.6% increase in the generating unit's average efficiency. Therefore, a second unit was upgraded in 2000. Based on average generation levels, this has translated into a cumulative gain of $1.25 million for both units. Four other units in the plant are being upgraded in 2001. Plans call for extending the MATH project to other selected generating facilities, which could bring its net present value to $75 million for the 2001–2010 period.

### *Technologies to facilitate the refurbishing of hydraulic turbine runners*

In the early 1990s, a compact robot called Scompi was developed to carry out repairs and construction in hard-to-reach areas of turbine runners. This reliable, user-friendly robot has since proven very useful in jobs on numerous Hydro-Québec turbines. The company has therefore decided to upgrade Scompi in order to improve the efficiency of on-site repairs. Capabilities have already been added to allow automated blade measurement, two-gun welding, plasma-arc cutting and automated grinding to reprofile blades.

As many of its generating units will complete 40 years of operation over the next 15 years; Hydro-Québec Production will need to step up its refurbishing program. Among other things, it expects to revamp the runner blades of 74 units whose efficiency no longer meets design criteria. Use of the Scompi robot will enable the division to accelerate its program and substantially reduce the downtime of each generating unit, which should result in savings of about $130,000 per unit for each year ahead of schedule.

## Technical and Market Intelligence

The success of a company's innovation strategy hinges not only on careful management, but also on a sound knowledge of the business environment, the players involved, and technological developments. To monitor these trends, Hydro-Québec has reinforced its intelligence-gathering capabilities by adopting two new approaches: venture capital operations and technological roadmapping.

## Venture capital

Over the past decade, venture capital has played a major role in technology-related R&D on this continent. This has been especially true in the energy sector within the last two years, given the increase in profitable investment opportunities as well as the growing number of emerging technologies that are transforming energy products and services.

Venture capital operations, which are managed chiefly by Hydro-Québec's CapiTech subsidiary, support Hydro-Québec's technical innovation strategy in three ways:

- They provide a window onto the investment market, allowing the company to identify emerging technologies with high growth potential.
- They keep the divisions informed of new technologies being introduced on the market.
- They provide a means of commercializing technologies developed by Hydro-Québec.

***Promising Technologies by Field of Endeavor***

| | Distribution | Transmission | Generation |
|---|---|---|---|
| Software packages and products for the integrated management of generating facilities and power systems | ■ | ■ | ■ |
| Real-time data acquisition, modeling and simulation systems | ■ | ■ | ■ |
| Energy storage | ■ | ■ | ■ |
| Fuel cells | ■ | | ■ |
| Microturbines | ■ | | ■ |
| New materials | ■ | ■ | ■ |
| Sensors and command, control, modulation and monitoring systems | ■ | ■ | ■ |
| Energy management | ■ | ■ | |
| Energy-related e-commerce systems | ■ | ■ | ■ |
| Customer management systems | ■ | | |
| Electrotechnologies | ■ | | |

A key aspect of Hydro-Québec CapiTech's market intelligence strategy consists in investing directly in companies—North American, for the most part—that have introduced or are in the process of launching technologies that could stimulate the growth of Hydro-Québec's divisions. Market segments targeted by Hydro-Québec CapiTech must therefore be related to the divisions' core operations. The table on the preceding page illustrates this relationship.

Nevertheless, venture capital initiatives must be profitable for the company. Aside from spinoffs for its divisions, Hydro-Québec aims for an average return on equity of 20% over five years.

Projects under consideration must meet the following criteria, which support Hydro-Québec CapiTech's investment and performance objectives:

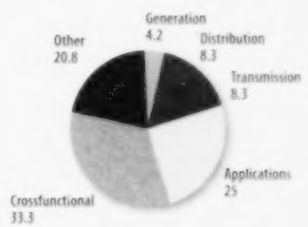
- marketable products and services of strategic importance for Hydro-Québec
- companies looking for seed money or in the pre-startup, startup or expansion stages
- attractive market
- partners also willing to invest in the venture
- well-defined, viable business plan with realistic exit strategies.

The figure opposite shows the distribution of companies in Hydro-Québec CapiTech's portfolio, by field of endeavor, as at September 30, 2001.

A portion of the portfolio is reserved for positions in energy venture funds. This approach enables Hydro-Québec CapiTech to broaden its knowledge of the market and diversify its portfolio considerably. Partners in these funds are selected on the basis of their ability to share information on business opportunities and new technologies.

This strategy has helped Hydro-Québec CapiTech to develop an impressive network of partners representing a cross-section of stakeholders in the energy venture capital market. It is therefore well positioned to contribute to the technological innovation efforts of Hydro-Québec's divisions by providing them with a strategic understanding of the marketplace.

***Breakdown of Hydro-Québec CapiTech's Portfolio by Field of Endeavor*** *(%)*



Hydro-Québec CapiTech also invests in commercializing technologies developed by Hydro-Québec. For example, a hydrogen storage technology developed by Hydro-Québec and based on metal hydrides gave rise to a new company called StoCo, in which Hydro-Québec CapiTech has a 35.71% stake. The remaining 64.29% is held by Dutch and German partners, Shell Hydrogen and Gesellschaft für Elektrometallurgie. On the other hand, some of the technologies developed by Hydro-Québec may require mass-production or a process that demands significant investments. These investments are arranged through the subsidiary Hydro-Québec IndusTech, whose portfolio is managed by Hydro-Québec CapiTech.

As at September 30, 2001, Hydro-Québec's venture capital portfolio stood as follows:

| Companies | Committed investments ($ millions) |
|---|---|
| Hydro-Québec CapiTech | 157 |
| Hydro-Québec IndusTech | 114[1] |

*1. Excluding the value of R&D performed in the past.*

| Geographic distribution of investments | Investment breakdown (%) | No. of companies |
|---|---|---|
| Québec | 62 | 16 |
| Canada outside Québec | 4 | 3 |
| Outside Canada | 34[1] | 11 |

*1. Including an investment in H Power (US) that is expected to produce economic benefits for H Power Enterprises of Canada (Québec).*

| Hydro-Québec CapiTech investments by type | Investment breakdown (%) | No. of companies |
|---|---|---|
| Direct investments | 70 | 24 |
| Venture funds | 30 | 4 |

## Technological roadmapping

A key difficulty in planning for the future lies in identifying discontinuities in the business environment. To overcome this difficulty, Hydro-Québec has added another dimension to its planning process. The new dimension complements traditional approaches by taking into account technological innovations and paradigm shifts which, over the long term, can have a major impact on the company's business model and even its reason for existence.

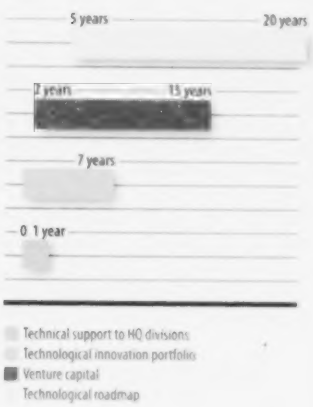
The approach consists in preparing a *technological roadmap* for the next 20 years integrating different scenarios based on technological breakthroughs, markets, customers, the environment or the regulatory context. The resulting roadmap is therefore neither an outlook based on an extrapolation of present conditions, nor an economic forecast based on emerging trends.

The technological roadmap constitutes one more aspect of Hydro-Québec's scientific and technological effort, which also includes projects aimed at providing technical support to the divisions as well as the company's innovation portfolio and venture capital initiatives.

Following a broad-based consultation of the scientific community as well as division specialists and external experts, Hydro-Québec developed five scenarios in which power systems and the business environment could undergo profound changes. In each of these scenarios, or "destinations," innovation will enable the company to remain at the forefront of the North American energy market by providing it with the necessary resources to

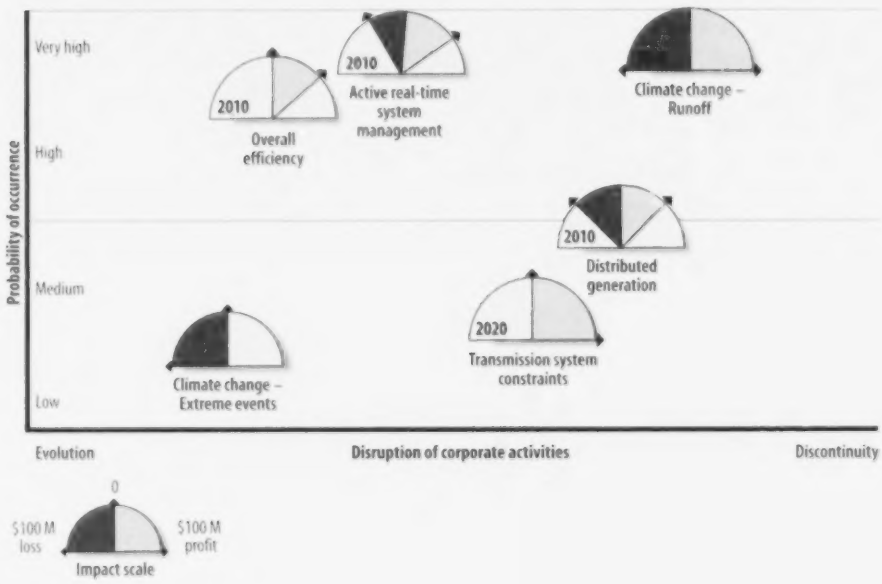
- actively manage its system in real time, so as to maximize returns on energy transactions
- understand the effects of climate change on runoff, electricity demand and operating facilities, and take appropriate action
- enhance the overall efficiency of its system, from generating stations all the way to customers' premises
- use distributed generation to its advantage
- use new energy storage and transmission technologies to expand the capabilities of its transmission network.

*Technological Intervention Horizon*



These five destinations correspond to the areas where paradigm shifts could have the largest impact on the company's technological and scientific evolution from 2010 to 2020. Obviously, the roadmap is a work in progress; it will have to be updated regularly and certain indicators (distributed generation, for example) will have to be revisited more regularly to reassess the destinations selected.

*Positioning of Chosen Destinations*




## Actively manage the power system in real time

The number and complexity of energy transactions will increase as the market becomes more competitive. This will have an impact on the power system, which will become more vulnerable and less reliable. The development of new technologies—such as power electronics, artificial intelligence, plug-and-play equipment, photonics and probability models for system simulation and control—will allow Hydro-Québec to actively

manage its system in near-real time. It will thus be able to increase power flow, boost its sales on external markets and consolidate its competitive edge in bids for the construction and operation of high-performance systems abroad. In so doing, the company will also optimize the use of its assets and reduce sales fluctuations by responding more effectively to market uncertainties.

## Understand climate change

Global temperatures are projected to rise steadily in the coming years, regardless of the mitigation measures advocated by the international community, in all demographic, economic, political, social or energy-related scenarios. Given that runoff constitutes its greatest external risk by far, Hydro-Québec will study the impact of climate change on this factor to improve management of the water-supply risk associated with its hydroelectric plants.

Moreover, extreme weather events can seriously compromise the integrity and security of Hydro-Québec's facilities. If the frequency of such events were to increase, the company would have to adjust its design criteria and reconsider its investment priorities.

To determine what correlations exist between runoff, extreme weather events and climate change, Hydro-Québec will use global and regional climatology models and rely on the help of the Canadian network of experts in this field.

## Improve overall system efficiency

To remain competitive, electric utilities will need to maximize the amount of power they can produce and deliver by enhancing the intrinsic efficiency of their facilities. Hydro-Québec can also stimulate demand for electricity by encouraging consumers to use energy-efficient electrotechnologies rather than fossil fuels.

The company therefore stands to benefit from participating in the development of superconductor equipment and electro-specific technologies that will increase the power system's overall efficiency, and hence profitability, by allowing it to generate and deliver more power.

Through such initiatives, it will fulfill its responsibilities as a good (and environmentally conscious) corporate citizen and increase sales in markets where customer needs can be met by low-energy-consuming electrotechnologies.

## Adapt to the emergence of distributed generation

By 2010, the cost of distributed generation—using microturbines, fuel cells or wind-powered facilities—could come close to that of centralized generation, if transmission and distribution costs are factored into the equation.

Hydro-Québec could therefore capitalize on technological breakthroughs in this area to optimize its distribution system, supply consumers in more remote areas, meet increasing demand, and lower the cost of operating off-grid systems.

The company also plans to study the impact of distributed generation on its export markets, particularly in the northeastern United States, as well as the implications of connecting multiple generation sources to its distribution system. Fuel cells, microturbines, wind generating stations and local storage are technologies it will be monitoring very closely.

## Overcome transmission system constraints

Beyond a certain distance, power transmission and distribution are no longer economical due to the inherent losses that occur in today's systems and the difficulty in delivering power to where it is needed. These constraints limit Hydro-Québec's geographic market to its more immediate neighbors. In addition, a unique feature of electricity is that it must be consumed as soon as it is generated. This additional constraint forces utilities to over-dimension their systems in order to meet peak demand.

Technological innovations in the areas of variable-parameter equipment, superconductivity, extra-high-voltage transmission and large-capacity storage, for example, will allow Hydro-Québec to overcome these constraints and gain access to lucrative new markets on the North American grid. These technologies will give TransÉnergie U.S. a competitive edge as a supplier and operator of transmission lines in the United States. They will also help to optimize Hydro-Québec's system and make it stronger, resulting in lower operating costs.

## Destination summary

In addition to the five destinations described above, Hydro-Québec's techno-watch activities could be expanded to include other specific areas in which emerging technologies could have an impact on the company's core operations.

***Summary of Destinations, Action Plans and Key Technologies***

| Destination | Horizon | Action Plans | Key Technologies |
|---|---|---|---|
| Actively manage the power system in real time | 2010 | • Control and increase power flow over the system<br>• Develop and integrate risk management models | • Power electronics<br>• Artificial intelligence<br>• Plug-and-play equipment<br>• Photonics and neural networks<br>• Probability models |
| Understand climate change | 2010 | • Determine the relationship between runoff and global warming<br>• Determine the relationship between runoff and natural variability<br>• Evaluate vulnerability and develop appropriate measures | • Global and regional climatology models |
| Improve overall system efficiency | 2010 | • Improve generating efficiency and reduce system losses in the context of an open market<br>• Promote the use of efficient electrotechnologies | • Superconductor equipment<br>• Polymer conductors<br>• Electro-specific technologies |
| Adapt to the emergence of distributed generation | 2010 | • Identify business opportunities<br>• Understand new technologies and how they can be integrated into the system | • Fuel cells<br>• Microturbines<br>• Wind power facilities<br>• Local storage<br>• Hydrogen |
| Overcome transmission system constraints | 2020 | • Triple the distance over which power can be transmitted economically and/or provide for cascading from one system to another (predetermined destinations)<br>• Develop storage technologies | • Variable-parameter equipment<br>• Superconductivity<br>• Extra-high-voltage transmission<br>• High-capacity storage (chemical, compressed air) |

Two of the five main destinations—adapting to decentralized generation and understanding climate change—have already been translated into strategic projects, and the same will be done for the other three.

# Resources Allocated to Innovation

## Human capital

The major changes required to consolidate the innovation project portfolio and launch strategic projects linked to the technological roadmap provide a unique opportunity to expand Hydro-Québec's talent pool. The success of the company's technological innovation efforts depends to a large extent on the expertise of the people involved. New expertise will have to meet future needs resulting from the destinations, action plans and projects it has defined. Such talent will allow Hydro-Québec to retain its position as a world-renowned leader in energy research.

Two strategies will be used to attain these objectives:

1. Development of expertise within the Hydro-Québec research institute through the implementation of a proactive training and recruitment policy targeting emerging fields in which the company foresees long-term needs. Areas that have already been identified include climatology and power electronics.
2. Establishment of strong networking capabilities with best-of-breed organizations to meet more short-term needs, or requirements whose strategic importance does not justify maintaining in-house expertise. Networking will take different forms:
   - Greater mobility of experts within Hydro-Québec.
   - Recruitment of university researchers to work on specific projects.
   - Cooperation with various companies, particularly in the final phases of innovation projects whose success will depend on developing appropriate manufacturing capabilities. In such cases, the company will rely on partnerships and the business incubator approach.

# Financial resources

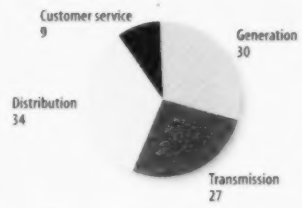
## *R&D investments*

R&D spending will be maintained at about $105 million per year. This includes the cost of implementing the action plans associated with the technological roadmap.

***Breakdown of R&D investments*** *($ millions)*

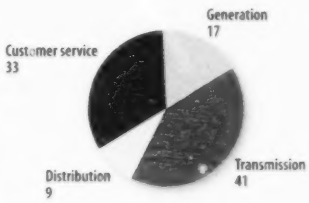
| Activity | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|
| Technological innovation project portfolio | 57.6 | 58.6 | 58.6 | 58.6 | 58.6 | 58.6 |
| Strategic and exploratory projects | 12.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |
| Technical support to Hydro-Québec divisions | 18.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| University research chairs | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 |
| Depreciation, amortization and financial expenses | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 |
| **Total** | **105.3** | **105.3** | **105.3** | **105.3** | **105.3** | **105.3** |
| External contracts | 13.1 | 10 | 10 | 10 | 10 | 10 |

***Innovation Project Breakdown*** *(%)*



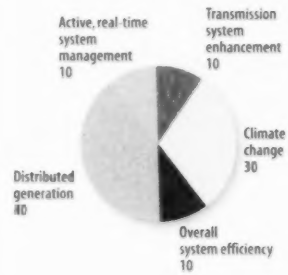

In 2001, spending on technological innovation projects totaled $57.6 million. The breakdown of innovation projects among the four areas of activity is based on the priorities established by the platform teams. It should remain relatively stable in the coming years.

***Breakdown of Technical Support Projects*** *(%)*




In 2001, $18.3 million was allocated to technical support projects. The breakdown among the four areas of activity is provided as an indication only, since spending in the coming years may vary according to operational requirements.

***Breakdown of Roadmap Projects*** *(%)*




A total of $5 million will be spent each year on projects related to the technological roadmap. The graph on the left shows the breakdown of these expenditures in 2001.

## *Venture capital investments*

For the past three years, Hydro-Québec CapiTech has focused its efforts on the search for business partners and opportunities in the North American energy technologies market. It has already made a significant contribution to the company's innovation effort through investments in promising new fields where needs had been identified by the divisions.

Today, Hydro-Québec CapiTech's portfolio includes more than 24 companies in different stages of development, ranging from pre-startup to listing on a recognized stock exchange.

In 2001, Hydro-Québec, through its subsidiary Hydro-Québec IndusTech, made a major investment to commercialize the LMP (lithium-metal-polymer) battery, which is based on the ACEP technology (a French abbreviation designating a polymer-electrolyte fuel cell) developed by IREQ researchers. The LMP battery will be developed and marketed by Avestor, in which Hydro-Québec and the U.S. firm Kerr-McGee Chemical LLC each have a 50% stake. The first manufacturing plant, in Boucherville, will start production at 35,000 batteries in 2002, ramping up to 175,000 the following year. Target markets include telecommunications, power utilities (peak management applications) and, in the longer term, the electric vehicle industry.

Barring unforeseen opportunities, Hydro-Québec expects to invest about $100 million in Hydro-Québec CapiTech's venture capital portfolio during the Strategic Plan period. No additional investments in Hydro-Québec IndusTech's portfolio are planned.

## Conclusion

The technical quality of Hydro-Québec's facilities, operations, products and services has always been a source of pride and profitability for the company and Québec's electricity industry as a whole.

Technological innovation is therefore a primary concern for Hydro-Québec, representing both a springboard for growth and a financial investment whose net present value is estimated at between $300 million and $700 million.

Accordingly, the company has set itself a clear objective: to consolidate its extraordinary innovation capabilities. By pursuing the efforts made within the past two years to implement stringent, up-to-date management practices that favor research partnerships and other collaborative arrangements, Hydro-Québec can count on world-renowned expertise to carry out large-scale projects.

## Appendix 3

# Energy Efficiency

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*Energy Efficiency in North America* 157

*Energy Conservation Potential* 161

*The Energy Efficiency Plan* 170

This appendix looks at energy efficiency in Québec homes and businesses. It reviews customer programs promoting consumption management and energy efficiency and describes the steps Hydro-Québec is taking to file a new comprehensive Energy Efficiency Plan with the Régie de l'énergie in 2002.

## Three Aspects of Energy Efficiency

Energy efficiency means handling the demand for energy more efficiently. Hydro-Québec focuses on three aspects of efficiency: energy conservation, management and use.

Energy conservation results from the adoption of behaviors and the use of equipment and fixtures that reduce consumption but meet the same needs.

Examples of energy conservation programs:

- electronic thermostats
- efficient lighting

Energy management consists in spreading out electricity consumption over time to optimize the use of the equipment required to supply customers.

Examples of energy management programs:

- residential dual energy
- interruptible power

Energy use involves promoting the use of the most appropriate source of energy for a particular need.

An example of an energy use program:

- programs that encourage the use of oil instead of electricity for heating in off-grid systems, given the high cost of producing thermal power.

## Customers' Expectations

For a number of years, Hydro-Québec has tracked its customers' changing expectations and their satisfaction with how these expectations are met. The expectations deemed to be priorities by customers generally involve safety around electrical plant and equipment, electricity rates, reliable service, accurate billing and the quality of customer service. All customers also expect Hydro-Québec to play a role in energy efficiency with programs, advice or information.

Customers' energy efficiency expectations have not, however, been among their top priorities since 1992. It is normal that energy efficiency should be given less importance than other, more basic, expectations. Hydro-Québec's historically low rates are another contributing factor.

Nevertheless, expectations related to electricity prices remain the top priority for all Hydro-Québec customers. Many customers who contact Hydro-Québec's call centres are looking for help in understanding their bills, their electricity consumption, and the amount they have to pay. Offering customers ways to control their consumption and thereby reduce their electricity bills probably improves their satisfaction with prices.

***Energy Efficiency Expectations***

| Residential Customers | Business Customers | Large-Power Customers (5 MW and over) |
|---|---|---|
| • Programs and discounts that encourage energy conservation<br>• Advice and information that encourage energy conservation<br>• Help in understanding electricity consumption | • Advice and programs that encourage consumption management and energy conservation<br>• Help in understanding bills, rates and consumption | • Advice and programs that encourage consumption management and energy conservation<br>• Rate options that encourage energy management<br>• Financial assistance to reduce the payback time for energy efficiency investments |

# Energy Efficiency, Past and Present

Hydro-Québec has always seen energy efficiency as a priority in marketing its product. Over the years, depending on supply/demand and business conditions, Hydro-Québec has introduced energy efficiency initiatives for all segments of its market. The company has geared its efforts in this regard to its customers' needs and the imperative of maintaining a balance between energy supply and demand. There have been five main periods, during which Hydro-Québec has focused on objectives that were somewhat different, although always related to the theme of energy efficiency.

## 1960–1973 – Intensive marketing of electricity

During this period, the market share for electricity increased considerably. Hydro-Québec established its market position by highlighting the performance advantages of electricity. After setting up a marketing structure in 1964, the company promoted higher standards for residential insulation (Medallion and Novelec homes), water-heater performance (Cascade), and energy audits for commercial buildings (CALMEC).

Hydro-Québec was very active on technical committees of such organizations as the Canada Mortgage and Housing Corporation (CMHC), National Research Council (NRC), and Canadian Standards Association (CSA).

## 1974–1980 – Promotion of energy conservation

The oil crisis in 1973, combined with a rapid increase in electricity sales, led Hydro-Québec to redefine its marketing activities and intensify its promotion of energy conservation. The company continued its efforts to standardize water heaters, electrical equipment and systems, and insulation in buildings heated with electricity. It lobbied the Québec government to apply the *Building Code* to single-family dwellings and multi-family dwellings with fewer than eight units, as well as to adopt more stringent energy efficiency standards.

Through major energy conservation awareness campaigns, Hydro-Québec was an active participant in the development of Canadian and Québec energy policies.

It was at the end of this period that customers of off-grid systems, starting with the Îles de la Madeleine, began to benefit from Hydro-Québec's energy efficiency initiatives, including a home-insulation program and the first version of a program encouraging customers to use fuel for heating.

## 1981–1990 – Major government projects supported by Hydro-Québec

The second oil crisis added a new dimension to energy efficiency. Hydro-Québec supported the major government programs that were introduced, including the Canadian Oil Substitution Program (COSP), Énergain Québec and Energuide. Hydro-Québec continued to support standardization by participating in CSA technical committees and lobbying for higher Building Code standards.

Although Hydro-Québec had an energy surplus, its concern with energy efficiency was very real. Consumption management became the main focus in the 1980s, and the company launched first residential dual-energy, then commercial, institutional and industrial dual-energy programs. It also had some capacity available in the form of interruptible power contracts with industrial customers.

The efforts of the governments and Hydro-Québec yielded results, particularly with regard to the insulation of existing homes and higher insulation standards for new buildings. Surveys showed that several

types of energy conservation behavior had been widely adopted and maintained (cold-water laundering, lighting reduction, reduced hot-water consumption, lower thermostat settings, unheated garages, cars not plugged in, etc.). These trends, added to the conversion of oil heating systems to electricity, helped to reduce the average energy consumption in Québec homes from an electricity equivalent of 48,000 kWh per year in 1971 to 28,000 kWh per year in 1990.

## 1991–1995 – Energy Efficiency Project

Having achieved a balance between supply and demand, Hydro-Québec launched an extensive Energy Efficiency Project as part of its plan to maintain the energy balance at the lowest possible cost, in addition to complying with the Québec government's energy efficiency strategy announced in the fall of 1992.

About 15 energy conservation programs were developed under this project, in addition to programs for maintaining and expanding the residential dual-energy customer base. Action was taken on several fronts.

***Market transformation initiatives***

- customer information and awareness
- training of market players
- development of the stock of efficient technologies by conducting research and development (e.g., integrated dual-energy system) and by influencing suppliers (e.g., ECONOS, electronic thermostats)
- contribution to the development of regulations

***Activities with short-term impacts***

- direct installation (electronic thermostats)
- financial assistance for purchasing and installing efficient technologies (for most programs)

At the same time as it was encouraging Quebecers to improve their energy efficiency, Hydro-Québec also began to manage its own consumption more intensively. During this period, the company introduced an ambitious energy efficiency program in many of the buildings it occupied (most of which it owned). By the time it ended, this program alone had saved 82 GWh of energy per year.

Hydro-Québec invested about half a billion dollars in the Energy Efficiency Project; this investment covered energy conservation and energy management activities. The project made it possible to save 2.5 TWh of energy per year and reduce the annual peak demand by about 400 MW. Residential dual-energy equipment was responsible for shaving about 870 MW off the peak as heating systems switched from electricity to auxiliary fuel. Most of these energy and power savings have been maintained ever since.

Furthermore, during this period, Hydro-Québec was able to count on 1,140 MW of interruptible power under arrangements with large-power industrial customers who agreed to reduce their power consumption to a predetermined level during particularly critical peak periods, in exchange for financial compensation.

The activities related to the Energy Efficiency Project are presented in the following tables.

## *Overview of the 1990–2000 Energy Efficiency Project – Energy Savings*

| **Residential Market** | **Brief Description** | **Energy Impact in 2000 (GWh)** | **Start and End** |
|---|---|---|---|
| Ecokilo | Program for analyzing household energy consumption and offering energy-saving products | 268 | 1991 to 1993 |
| Econos (phases 1, 2 and 3) | Program promoting energy-saving products | 175 | 1991 to 1993 |
| Direct Installation (Écono-Confort) | Phase 1: Free installation of energy-saving devices, mainly electronic thermostats | 75 | 1993 to 2001 |
| | Phases 2 and 3: Sale and installation of electronic thermostats | | |
| Other programs | | 18 | 1990 to 1999 |
| ***Total energy saved*** | ***Residential market*** | ***536*** | |
| **Commercial and Institutional Markets** | | | |
| H-Q Building Efficiency Improvement (phases 1 and 2) | Improvement of energy efficiency in Hydro-Québec buildings | 82 | 1991 to 1998 |
| Public Lighting | Conversion of municipal lighting from mercury to sodium | 152 | 1992 to 1995 |
| Building Energy Analysis Program (BEAP) | Energy audits for commercial, institutional and industrial buildings | 241 | 1991 to 1997 |
| Energy-Efficient Lighting | Promotion and installation of energy-efficient lighting in commercial, institutional and industrial buildings | 360 | 1991 to 1996 |
| ***Total energy saved*** | ***Commercial and institutional markets*** | ***835*** | |
| **Industrial Market** | | | |
| High-Efficiency Motors | Financial assistance for the purchase of high-efficiency electric motors | 125 | 1991 to 1995 |
| Energy Efficiency Program Program for Industrial Processes | Improvement of energy used by industrial processes in large-power companies to reduce electricity consumption | 447 | 1991 to 1999 |
| Energy Optimization Programs: PFCS, Auxiliary Systems and other programs | Series of programs offering financial and technical assistance for introducing efficiency measures for pump, fan and compressor systems. Available to industrial and municipal customers. Phase 1 was called PFCS, phase 2 Auxiliary Systems (mainly for air leaks and ventilation systems), and phase 3 Energy Optimization Program – Systems | 513 | 1991 to 1999 |
| ***Total energy saved*** | ***Industrial market*** | ***1,085*** | |
| ***TOTAL ENERGY SAVED*** | | ***2.5 TWh*** | |

*Overview of the 1990–2000 Energy Efficiency Project – Load Management*

| Residential Market | Brief Description | Energy Impact in 2000 (GWh) | Start and End |
|---|---|---|---|
| Dual-Energy Plus – Phase 2 (maintenance) | Subsidies for maintenance of dual-energy heating systems | – | 1989 to 1994 |
| New Dual-Energy (installation) | Program for subsidizing installation of dual-energy heating systems in homes | – | 1991 to 1994 |
| Option Dual-Energy (installation) | Extension of the New Dual-Energy Program, in conjunction with the Société d'habitation du Québec (Québec housing agency) Accent on Renovation Program | – | 1994 to 1995 |
| ***Total residential dual energy*** | | *Nearly 120,000 DT subscribers* | |
| | | *870 MW shaved off peaks* | |
| **Interruptible power** | Agreements with large-power industrial customers to lower their power consumption to a predetermined level during particularly critical peak periods in exchange for financial compensation | Interruptible power volume: 1,140 MW | |

## 1995–2001 – A new legislative context

Although most of the large-scale programs came to an end as planned, Hydro-Québec has continued to play an active role in energy efficiency, as evidenced by the list of current initiatives in the following section. The company has also pursued its energy efficiency improvements in its own buildings. These efforts, combined with those of other players involved in energy efficiency, have helped transform the market through changes in regulations and in customers' habits and behavior.

This period saw the introduction or updating of a number of standards and regulations, including those dealing with

- efficient thermostats
- household appliances (washers, dryers, dishwashers, refrigerators, stoves, water coolers)
- lighting fixtures (ballasts, fluorescent lamps, reflectors)

- air-conditioning equipment (air conditioners, heat pumps, dehumidifiers)
- high-efficiency electric motors
- water heaters

The legislative context changed at the end of 1996 with the creation of the Régie de l'énergie, a regulatory body with authority over Hydro-Québec. The Régie's powers directly and indirectly affect Hydro-Québec's energy efficiency activities. For example:

- For its distribution operations, Hydro-Québec must obtain the Régie's approval of an electricity supply plan describing the provisions of the contracts it intends to sign to meet the needs of Québec markets once energy efficiency measures have been applied (see Section 72 of the *Act respecting the Régie de l'énergie*).
- The Régie may set a rate for a consumer or a class of consumers, for the purpose of financing energy conservation measures that are not profitable for Hydro-Québec but that are profitable for the consumer or class of consumers (see Section 49 of the *Act respecting the Régie de l'énergie*).

In 1997, the Québec government went on to create the Agence de l'efficacité énergétique (energy efficiency agency); its mission is to promote energy efficiency for all energy sources, in all sectors of activity throughout Québec, with a view to sustainable development.

In tandem with this legislative restructuring, Hydro-Québec confirmed its intention of continuing its energy efficiency endeavors with the commitments made in recent strategic plans:

***Strategic Plan 1998–2002***

- not to compromise the energy savings achieved, which were in the order of 3 TWh
- to maximize returns from energy efficiency initiatives
- to continue to implement cost-effective programs

***Strategic Plan 2000–2004***

- to offer customers new services to help them understand and optimize their electricity consumption
- to provide customers with advice on purchasing more efficient appliances and on energy conservation in general
- to propose energy efficiency programs to the Régie in which the portion of the cost exceeding the cost of service will be borne by the customers who benefit from them
- to work with the Agence to evaluate the residual energy conservation potential in Québec

This year, as announced in its *Strategic Plan 2000–2004*, Hydro-Québec began a thorough review of the residual potential for energy conservation in Québec, in collaboration with the Agence.

In this context, Hydro-Québec plans to begin an information and dialogue process on energy efficiency in the fall of 2001. This process, which will begin with the tabling of Hydro-Québec Distribution's Electricity Supply Plan, will lead to the development of an Energy Efficiency Plan to be submitted to the Régie in 2002. In this plan, Hydro-Québec expects to present the energy savings potential, suggest the most effective marketing initiatives, and determine an appropriate method of financing.

## Current Activities

Energy efficiency remains a primary concern today and colors all of Hydro-Québec's marketing operations, from communication and sales programs to R&D and market research.

The following tables list Hydro-Québec's main marketing initiatives that could have a direct or indirect impact on energy efficiency. It can be seen that energy efficiency is still an important aspect of the company's market offering.

## *Residential Customers*

| Current Program or Activity | Objective or Brief Description |
|---|---|
| Support for the Agence's Novoclimat program | Certification for new residential construction incorporating better-than-average energy efficiency. This concept developed by the Agence follows up on Hydro-Québec's Nouveau Confort program. |
| Special energy efficiency committee of the Union des producteurs agricoles and Hydro-Québec | Joint task force that promotes the distribution and installation of targeted, profitable energy efficiency measures for agriculture. |
| Committee of municipalities (Association québécoise pour la maîtrise de l'énergie) | Task force that promotes municipal energy efficiency in economic, human and community development. |
| Rate DT | Rate available since 1987 for residential customers who heat their homes with a dual-energy system in compliance with Hydro-Québec's Rate Bylaw. |
| Energy efficiency programs for off-grid systems | Group of programs encouraging customers of off-grid systems to heat space and water with oil instead of electricity. This minimizes thermal power production without compromising the reliability of electricity service. |
| Toll-free energy information line 1-800-363-7443 | Line set up in 1990 to answer the many questions from customers (especially residential) about electricity and its uses, energy efficiency, and Hydro-Québec's marketing programs, construction projects, facilities and activities. |
| *HydroContact* newsletter | Newsletter sent to residential customers and small businesses with their bill. It contains information on electricity, its uses, energy efficiency and marketing programs. |
| Home automation | Equity stake in General Domotic, a new joint venture of Hydro-Québec and Microtec that will develop and market home-automation technology for managing energy and other household systems. |

## *Business Customers*

| Current Program or Activity | Objective or Brief Description |
|---|---|
| Support for optimization of business customers' use of electricity | Ongoing support for optimization of electricity consumption and introduction of efficient solutions for all electricity uses. This support may take several forms:<br>• calculation of the economic impact of selecting a technological solution<br>• energy audit and advice on energy efficiency<br>• help with selection of an efficient system and optimization of existing facilities<br>• choice of cost-effective technological solutions<br>• technical support<br>These custom consulting services are currently being enhanced. |

## *Large-Power Companies* (5 MW of power and over)

| Current Program or Activity | Objective or Brief Description |
|---|---|
| Customized support | The special needs of large-power customers, especially industrials, call for customized support that may involve<br>• technological support for improving industrial processes<br>• energy audits of processes<br>• energy audits of buildings<br>• power quality studies |

## *All Customers*

| Current Program or Activity | Objective or Brief Description |
|---|---|
| Support for standardization and regulation | Steering of strategic committees dealing with the efficiency of electrical appliances to encourage improved performance. |
| Market research | Studies that measure the changes in customers' energy consumption and determine their priorities and their satisfaction with how their expressed expectations are met. |
| Technological R&D projects | Research on new technologies and evaluation of the performance of promising options.<br>Current projects and innovations deal with the following areas:<br>• food safety and quality<br>• water quality and wastewater treatment<br>• recovery of residues and by-products<br>• efficiency of materials processing and conversion<br>• load management and energy savings<br>• air-conditioning systems for commercial and institutional buildings (heat recovery and accumulation, geothermal energy) |

## *Hydro-Québec Buildings*

| | |
|---|---|
| Improvement of energy efficiency in Hydro-Québec buildings | Several initiatives, including:<br>• consumption tracking and user awareness<br>• improved heating management in certain buildings<br>• energy audits and cost/benefit studies for new measures<br>• creation of energy committees in some buildings |

## Avenues being explored

- Information and energy management services related to new metering technologies: we are looking at various services we could offer to business customers who will be having networked meters installed. One of the main objectives of these future services will be to meet customers' energy management expectations.
- Understanding of consumption: various means are being considered to improve residential customers' understanding of their consumption and its fluctuations. The following section discusses the action taken in this regard.

## Importance of energy audits and understanding consumption

In the *Strategic Plan 2000–2004*, Hydro-Québec announced its intention to offer its customers new services to help them understand and optimize their electricity consumption. In addition to meeting a need expressed by customers, such services may help them improve their energy efficiency.

In recent hearings on the conditions governing the supply of electricity, it was agreed with the Régie that Hydro-Québec would consult stakeholders about the most appropriate ways to help customers understand their consumption.

This consultation and discussion process had already begun when Hydro-Québec suggested to the Régie and the other stakeholders that a formal Issue Table be created to discuss an action plan. The objective of the action plan would be to give customers information to help them understand their electricity consumption so they can make decisions and act upon them.

Hydro-Québec offered to keep the Régie informed of progress resulting from the consultation and to submit, for its information, an action plan that would incorporate stakeholder concerns whenever possible.

## Energy management and use

A close look is now being taken at energy management. The changes that have occurred in the energy industry may have repercussions on Hydro-Québec Distribution's cost structure, which would require certain adjustments to consumption management strategies.

The impacts of most of the company's past energy management initiatives are still significant today.

Hydro-Québec can still count on an interruptible power volume of 420 MW for the winter of 2001–2002, as a result of agreements signed with large-power industrial customers. In exchange for financial compensation, they will reduce their power consumption to a predetermined level during particularly critical peak periods.

In addition, the residential dual-energy customer base of some 120,000 customers continues to be an important means of managing the demand for power. About 870 MW less electricity is required during peak periods when customers switch from electrical to auxiliary heating. This customer base has been built up through the company's marketing initiatives and its participation in the development of the integrated dual-energy system. Rate DT is still available to support residential dual energy.

Rate BT (dual energy in commercial, institutional and industrial markets) no longer meets Hydro-Québec Distribution's needs in terms of marketing strategy or profitability. An application to rescind this rate is expected to be filed with the Régie. Elimination of this rate option would involve transitional measures to minimize the impacts for the customers concerned.

New programs encouraging energy management may be developed within the period covered by the Strategic Plan.

With regard to energy use, the profitability of energy efficiency programs for off-grid systems will be reviewed. If necessary, changes to these programs or to some of their terms and conditions will be recommended to the Régie.

### Accent on energy conservation

The Energy Efficiency Plan that Hydro-Québec intends to submit to the Régie will emphasize energy conservation.

Although great strides have been made in this area, especially during the past decade, recent analyses show that there is still a certain potential for energy conservation which would be beneficial for Québec society, and that this potential can now be exploited.

## Quebecers' Perceptions

The energy efficiency habits and behavior of residential customers have been studied regularly since 1990 and were surveyed again at the end of 2000. The following table shows the main results.

It can be seen that Hydro-Québec's public awareness campaigns have produced measurable results. Most customers questioned during this survey said they knew about the energy conservation concepts proposed by the company.

The adoption rate for some energy conservation measures has been relatively stable since the early 1990s. This result leads us to believe that these measures have achieved a certain maturity. However, the updated technological and economic potential indicates that some behavioral measures still have real potential, especially since they are not expensive to implement. New strategies that are better targeted and more adapted to customer concerns will likely have to be developed to increase their adoption rate significantly. Certain meaningful changes could also contribute to this, such as increasing rates or reducing the customer's outlay, as long as this is possible and economically viable.

The level of adoption of energy conservation measures varies depending on the effort and financial investment required of the customer. Simple measures that do not demand much effort or cost, such as running the dishwasher only when it is full or washing clothes in cold water, achieve an adoption rate above 50%. Measures that require higher expenditures and appear more complex to the customer are not as well received. This is the case for improvement of insulation, for example.

***Changes in Answers to Certain Questions Since 1990*** (%)

| ***Knowledge of energy conservation measures*** | **1990** | **1994** | **1998** | **2000**[1] |
|---|---|---|---|---|
| Know enough / have enough information | 27 | 39 | 66 | 79 |
| Need more information / not enough information | 72 | 59 | 28 | 20 |
| Not interested / don't know | 1 | 2 | 6 | 1 |

| ***Quality of the information provided***[2] | **1990** | **1992** | **1998** | **2000** |
|---|---|---|---|---|
| Very satisfactory / very good | 15 | 23 | 26 | 23 |
| Somewhat satisfactory / somewhat good | 65 | 61 | 37 | 36 |
| Satisfactory | n.a. | n.a. | 25 | 26 |
| **Total satisfactory / good** | **80** | **84** | **88** | **85** |

| ***Level of concern about energy conservation*** | **1990** | **1994** | **1998** | **2000** |
|---|---|---|---|---|
| Very concerned | 22 | 23 | 21 | 23 |
| Fairly concerned | 63 | 65 | 54 | 55 |
| **Total very and fairly** | **85** | **88** | **75** | **78** |

| ***Level of energy conservation effort*** | **1990** | **1994** | **1998** | **2000** |
|---|---|---|---|---|
| A lot of effort | 24 | 26 | 33 | 32 |
| Some effort | 61 | 63 | 56 | 54 |
| **Total of a lot and some** | **85** | **89** | **89** | **86** |

| ***In my opinion, home comfort is more important than the money that can be saved on electricity***[3] | **1990** | **1992** | **1998** | **2000** |
|---|---|---|---|---|
| Strongly agree | 16 | 23 | 28 | 35 |
| Agree | 42 | 38 | 41 | 48 |
| **Total strongly agree and agree** | **58** | **61** | **69** | **83** |

1. *In 2000, the question was changed slightly. It read "Do you have enough information on energy conservation?" as compared with "Do you think you know enough about energy conservation measures or do you need more information?" in the other surveys.*
2. *In 1990 and 1992, the scale for this question was quite different.*
3. *In 1990 and 1992, the scale used was quite different (totally agree, somewhat agree, somewhat disagree, totally disagree).*

Quebecers are attributing more importance to home comfort. For most respondents, comfort takes precedence over savings. Hence, the proportion of people who are not inclined to make compromises in this area has risen steadily, from 58% in 1990 to 69% in 1998, then to 83% in 2000. This result suggests that some customers would not adopt energy conservation measures if they had an unfavorable impact on their comfort.

In general, the survey reveals that

- Quebecers consider that their habits and behaviors are generally efficient and they appear to have adopted many of the less burdensome measures.
- They consider themselves well-informed and are satisfied with the energy efficiency information Hydro-Québec provides.
- Comfort is increasingly important to them, and generally more important than energy efficiency.

## Energy Efficiency in North America

Hydro-Québec closely monitors energy efficiency developments across North America. This enables it to assess its own energy efficiency efforts and, especially, to benefit from the knowledge and experience acquired by other electricity suppliers. Remember, however, that certain characteristics of the Québec market, particularly the regulatory context, mean that the North American experience cannot be directly or entirely applied to Québec.

Several phenomena in the U.S. market over the past decade have had major repercussions on the scope and nature of the energy efficiency initiatives promoted and managed by electricity suppliers.

1. Industry restructuring and market liberalization began in California in 1994. As of August 2001, 25 states had been affected, while 26 were considering the soundness and impact of such measures. The impact of market deregulation has been felt in several areas.

   - To prepare for competition, some electricity suppliers have cut various discretionary expenditures: their energy efficiency and demand-management spending fell significantly from its high point in 1993 to the 1998 level.

   - In general, regulated rates of return and requirements for integrated resource planning have been replaced by various types of price caps, which are perceived by electric utilities as curbs on the further deployment of energy efficiency programs.

   - Since compensation for energy efficiency–related loss of revenue has proven complex, contentious and costly to implement, these mechanisms are gradually being dropped in various states.

   - Most of the restructured states and some unrestructured ones (20 states so far) have enacted legislation to set up Public Benefit Funds that are financed by surcharges on retail bills. These funds have been created to support various public-interest programs on energy efficiency, R&D, renewable energy or programs for low-income customers. They generally cover activities with short-term impacts.

     With regard to energy efficiency programs, these funds are administered according to one of three models: a predominant model in which the programs are managed by the electric utilities, a second one where they are managed by public agencies, and a third where they are managed under contract by one of the electric utilities. Some funds combine program management with performance incentives.

2. The 2000–2001 energy crisis in California and other western states has shaped the current national debate by raising basic issues concerning security of supply and the merits of extensive market restructuring. This crisis has led to the emergence of various phenomena in the United States:

- the growing importance of the reliability of regional supply systems and the role of energy efficiency within these systems
- an increase in energy efficiency investments, a resurgence of interest in peak-management programs (and energy efficiency programs that have an impact on peaks) and recourse to real-time billing
- a pause for reflection and a hiatus in the market restructuring process where legislation has not yet been passed

**3.** The regional transmission organizations (RTOs) being created in compliance with FERC Order 2000 may eventually be given some responsibility for delivering energy efficiency programs.

**4.** An omnibus energy act containing certain energy efficiency objectives is scheduled to be tabled in federal legislative bodies in the fall of 2001.

**5.** There are more market transformation activities due to their increasingly sought-after structuring effect on the energy efficiency products and services industry. Market transformation activities are strategic moves designed to introduce sustainable changes in the structure, operation and behavior of a market for the purpose of increasing consumers' use of efficient products, services and practices. An example would be encouraging manufacturers to adopt a certain standard in manufacturing their products before that standard becomes regulatory. Market transformation activities are planned, designed and managed by regional not-for-profit organizations in which public utilities, government and regulatory agencies participate. In addition, these organizations are active in the structural activities promoted by the Department of Energy and the Environmental Protection Agency (energy efficiency standards, labels, R&D, etc.).

With regard to the evaluation of energy efficiency potential, a number of references support the existence of sizeable reserves of energy efficiency. However, no consensus has been reached as to the levels involved or how much of this potential should be included in the targets and objectives for energy efficiency programs. Targets are generally based on the available budgets for energy efficiency. The practice used in the most common Public Benefit Fund model is to hold public hearings and then set a unitary surcharge that is acceptable to the consumer and will generate the available budget to achieve realistic objectives within a given time frame. Finally, the multitude of players involved in energy efficiency makes it difficult to give credit for the impact of initiatives, especially for market transformation activities. Various theories on this topic are being studied, with a view to fairly recognizing effort and, more importantly, avoiding accounting for the impacts twice.

In the unrestructured American states, the scope of energy efficiency initiatives varies greatly and appears to depend largely upon the regulations governing electric utilities and the specific context of each state (supply costs, revenue, environmental issues, customer expectations and input).

In Canada, two of the provinces where electric utilities are seen as especially active in energy efficiency are British Columbia and Manitoba. BC Hydro and Manitoba Hydro are still vertically integrated companies whose rates are regulated by energy boards.

Both utilities have been operating for years in a context of stable rates. Neither of them has submitted an integrated resource plan for several years. Indeed, they are not subject to any regulations in this matter. BC Hydro published an energy efficiency plan in 1994–1995.

In British Columbia and Manitoba, energy efficiency expenses incurred by the electric utilities—both for energy efficiency programs with short-term impacts and for market transformation initiatives, which account for a significant proportion of spending—are included in the revenue used in rate setting.

BC Hydro and Manitoba Hydro have both established clear benchmarks for technological and economic potential in their territories. These benchmarks are updated periodically.

In Canada, as in the United States, energy efficiency objectives vary substantially, depending upon

- the legislative and regulatory context in which the utility operates
- the expectations and participation of the targeted customers
- the scope of the potential, which in turn depends on what has already been done for energy efficiency; the avoided cost considered in determining the potential (cost of service, opportunity costs); customer consumption profiles; and rate levels
- the importance accorded to market transformation initiatives among all energy efficiency activities

## Energy Conservation Potential

An overall analysis of a program or group of programs involves a feasibility study that assesses the achievable energy conservation potential for each measure. To determine this achievable potential, the technological and economic potential must first be assessed.

## Technological and economic potential

The technological and economic potential means the energy savings that would result from implementing available measures everywhere they are technologically and economically feasible, regardless of consumers' acceptance of these measures.

From Hydro-Québec Distribution's point of view, this potential represents the total available energy savings with a unit cost less than or equal to the avoided cost, also called the marginal cost of electricity (supply + transmission + distribution). For example, suppose that the avoided cost for a given residential use is 6¢ per kilowatthour. In this case, the measures that would be retained in determining the technological and economic potential are those for which the cost is equal to or less than 6¢ per kilowatthour. The cost is based on the number of kilowatthours that the measure would save over its lifetime.

The avoided cost varies depending on the way energy is used and, sometimes, the market in which it is used (residential, commercial, institutional, industrial). The potential is therefore estimated by market and by type of use.

The following characteristics of the Québec market limit technological and economic potential:

- The marginal cost of electricity is low because it is based, in the short term, on electricity from the heritage pool and on optimal use of the transmission and distribution systems. Some technologies and products do not meet the recognized profitability criteria in Québec, whereas they are often the very basis for measures introduced by electric utilities elsewhere.
- Cumulative and side effects often have a negative impact in Québec and reduce achievable energy savings. The importance of heating in Québec explains this phenomenon. Reducing electricity consumption by using more efficient products (lightbulbs, for example) may increase heating requirements because the old type of bulb gave off more heat than the new one. In areas with warmer weather, side effects are positive because they reduce the need for air-conditioning.

Hydro-Québec, in conjunction with the Agence, is completing an update of the technological and economic potential for all markets.

Note that this potential does not necessarily include all possible energy conservation measures for all markets. Rather, it deals with the most widespread current technologies and some that are expected in the coming years.

New estimates in 2001 establish the technological and economic potential at about 6 TWh over five years. As the following table shows, the sharp drop from the 1992 figures (which covered a 10-year horizon) was roughly equivalent in all three markets. It should be remembered that the technological and economic potential is not the achievable potential; the latter is necessarily lower because it is also based on the expected customer buy-in in response to the programs offered. The achievable potential is discussed below.

***Change in Technological and Economic Potential*** *(TWh)*

| Market | Potential 1992 | Potential 2001[1] | Change 1992–2001 |
|---|---|---|---|
| Residential | 10.9 | 2.6 | (8.3) |
| Commercial and institutional | 7.4 | 2.2 | (5.2) |
| Industrial | 9.3 | 1.2 | (8.1) |
| **Grand total** | **27.6** | **6.0** | **(21.6)** |

*1. To be confirmed.*

The main factors responsible for the lower potential are as follows:

- impact of programs—savings achieved through previous programs
- natural savings, i.e., the carryover effects of programs offered by Hydro-Québec and others and the impact of new standards and regulations: household appliances, lighting, high-efficiency electric motors, air-conditioning equipment, water heaters, replacement of equipment at the end of its life cycle, and construction and major renovation of buildings
- better understanding, due to acquired experience, of certain parameters such as the current rate of adoption of measures, the unit cost of implementing the measures, the unit energy gains produced by the measures, and the impacts of cumulative and side effects
- avoided costs by type of use and by market that were lower than in 1992 (see the explanation below)

### *Explanation of lower avoided cost*

Avoided cost represents the cost of electricity anticipated by Hydro-Québec Distribution for a given window of time equivalent to the average lifetime of the measures concerned. All components of this cost have fallen since 1992.

- Since 1998, Hydro-Québec Distribution's cost of supply has been equivalent to the price it pays to the supplier. In the short term, this is the price related to heritage pool electricity: it is set by law and does not include the marginal cost of new supply. The estimated cost of new supply comes into play after the heritage electricity pool of 165 TWh is exceeded.
- Likewise, the lower transmission and distribution costs reflect the overall availability of the distribution and transmission systems and the work done to optimize their use.

These changes in the calculation of avoided cost, plus the changes in the applicable economic parameters, mean that, for some uses, it is about 50% lower than its 1992 level.

## Highlights of the technological and economic potential update

### *Residential market*

- Behavioral measures such as reducing room temperature, particularly during unoccupied periods and at night, have been adopted by a high percentage of customers.
- Some accessories, such as showerheads, are no longer included in the potential because manufacturers now distribute very efficient products that comply with current regulations. The same holds true for household appliances, for which regulations have become stricter.
- The main potential relates to heating: the measures dealing with lower temperatures and the use of electronic thermostats account for most of the potential.
- Some measures for improving the thermal performance of building envelopes during renovation also represent a substantial portion of the potential.
- There is interesting potential in the use of timers to reduce operating times for pool filters.
- The potential of new construction is included in the market uses.

### *Commercial and institutional markets*

- The thermal envelopes of all new buildings and expansions must comply with the *Regulation respecting energy conservation in new buildings*, thus considerably reducing the profitable potential beyond the Regulation criteria. The profitable potential for renovation, with regard to thermal envelopes, is also low due to the high cost of such measures.
- The potential lies mainly in lighting and air systems (HVAC, heat recovery) in both new construction and renovation. The measures for optimizing controls and improving equipment management represent a major proportion of this potential.

### *Industrial market*

- Process control now appears to be the dominant component of energy conservation potential.
- Another important aspect is related to behavioral changes in plant operation. However, it is often difficult to introduce and maintain new behaviors.
- High-efficiency motors are not included in the analysis because they have been regulated in Canada since 1997.
- The potential for processes other than motive power (mainly electrolysis) is significantly reduced by the exclusion of any potential linked to the modification of industrial processes, since energy improvements are achieved naturally through plant modernization and new construction.

## Achievable potential: A realistic objective

Achievable potential is defined as energy conservation through the implementation of economically profitable measures adopted by customers as a result of marketing initiatives over a given period. Unlike technological and economic potential, this potential incorporates expected consumer adoption of behavior in response to marketing.

Several factors may limit adoption or maintenance of a measure by consumers. These are

- the low electricity rates in Québec, which provide little incentive for efficient behavior
- the lack of motivation and persistence in the case of behavioral measures
- purchasing behavior: energy efficiency gains often compete with other decision criteria such as aesthetics or improved comfort
- the payback period that the customer will accept, which varies according to the type of measure and the market
- skepticism regarding the measure's benefits (fears of reduced comfort, difficulty evaluating the resulting savings)

- various other business considerations such as market structure, the number of manufacturers, distribution of efficient products, and the availability of less efficient products on the market, especially when they are less expensive
- aversion to risk and fear that equipment will be less reliable, especially for the industrial market

In a recent survey of the residential market, most respondents said that energy efficiency was still a concern. This interest makes it appear likely that residential customers would be receptive to new energy conservation measures.

This evaluation of the residual technological and economic potential, the factors discussed above and the experience acquired in the past decades have led Hydro-Québec to set the realistic objective of saving 0.4 TWh of energy by 2006, through new activities targeting all of its customers. This objective represents roughly 7% of the approximately 6 TWh of technological and economic potential. All the investments needed to achieve this 0.4-TWh target will be factored into the calculation of revenue for the next Hydro-Québec Distribution rate case.

It should be remembered that the last Energy Efficiency Project achieved 2.5 TWh, or nearly 10% of the potential, which at the time was estimated to be 27.6 TWh. However, this result was achieved in 1998 after eight years of effort, whereas the 0.4-TWh objective in the new Plan has only a three-year horizon. Moreover, achievement of the 2.5 TWh required investments by Hydro-Québec of over $300 million, which contributed to the rate increases implemented during the project period (1991–1998).

The residual technological and economic potential includes some remaining easy and behavioral measures that require little investment and that Hydro-Québec plans to implement without, however, neglecting the more weighty, complex measures that also contribute to the potential. These measures, which deal with the structure of buildings or heavy equipment, are generally only profitable when they form part of scheduled renovations or new construction. Therefore they cannot be achieved as quickly as desired. We must accept that they will be implemented at the natural pace of building renovation and construction.

Certain scenarios are currently being studied, particularly with a view to covering areas where the greatest technological and economic potential exists. These scenarios will be developed and discussed with the parties concerned.

## Profitability and selection of activities

The following tests, recognized by the Régie de l'énergie, will be used to evaluate each activity in the Energy Efficiency Plan.

### *Participant test*

This test gives an indication of the economic worth of the program for the customer. It considers the costs and quantifiable benefits of an energy conservation program from the point of view of the participating customer. Its result is translated into a payback period (PP) deemed to be more or less acceptable depending on the customer category and the type of measure.

### *Rate-neutrality test*

This test evaluates the impact of an energy conservation program on the Distributor's earnings and provides an indication of the possible impact on rates. It measures the difference between the variance in the Distributor's revenue and the variance in its operating and capital costs, due to an energy efficiency program. When Hydro-Québec Distribution's energy conservation expenditures, added to the lost sales of the kilowatthours saved, are less than or equal to the marginal cost of electricity (supply + transmission + distribution), the energy savings are considered to be rate-neutral because they do not contribute to rate increases. In the opposite case, they are not rate-neutral because they tend to push rates upward, since all the capital spending incurred to achieve them must be factored into the calculation of revenue for the Distributor's next rate case.

This test provides some indication of the impact of a given energy conservation program on nonparticipants due to the pressure on rates.

### *Total-cost-of-resources test*

This test measures the benefits and total net cost of resources for an energy conservation program by including both the Distributor's and the customers' points of view. It is the sum of the rate-neutrality and participant tests.

### *Selection criteria for activities*

The following criteria will be used to select the initiatives to be included in the Energy Efficiency Plan.

- Activities that do not pass the total-cost-of-resources test and/or for which the result of the participant test (payback period) is unacceptable for the targeted class of customers will be rejected.
- The other activities will be selected or prioritized according to the following criteria:
  - the volume of the achievable potential
  - the result of the rate-neutrality test and the possibility of obtaining appropriate and acceptable funding for all customer groups
  - the value-added component as compared to initiatives already taken by other parties and the potential for synergy and complementarity (to optimize impact and minimize costs)
  - the commercial and technological risks

## The Energy Efficiency Plan

In the fall of 2001, Hydro-Québec plans to begin an information and dialogue process on energy efficiency. This process will commence with the tabling of Hydro-Québec Distribution's Electricity Supply Plan and lead to the development of an Energy Efficiency Plan, which will be submitted to the Régie in 2002. In developing this plan, Hydro-Québec expects to present the potential for energy savings, suggest the best marketing initiatives and define appropriate, acceptable funding methods for all customers.

The proposed Energy Efficiency Plan, to be submitted for the Régie's approval, will be based on the following parameters:

- The proposed Plan will be for three years, with periodic reviews and gradual deployment beginning in 2003. At first, it will stress energy conservation.
- The proposed Plan will consider the customers who most need to improve their energy efficiency, namely low-income customers.
- To optimize the impact of its efforts and investments, Hydro-Québec will seek complementarity and synergy with the energy efficiency initiatives of other organizations, especially its government partners.

Energy efficiency has always been a priority for Hydro-Québec. Its recent Energy Efficiency Project, implemented over the past decade, saved 2.5 TWh of energy. Many of its initiatives have contributed, and still contribute, to the development of a regulatory framework for energy efficiency, as well as to natural savings. Natural savings for the period from 2001 to 2006 are anticipated to be 1.2 TWh.

Having observed that there is still worthwhile potential for energy savings in Québec, Hydro-Québec plans to achieve another 0.4 TWh of savings by 2006. This objective takes into account the customers' most important expectation: low rates. To optimize the impact of its endeavors, Hydro-Québec intends to complement its partners' actions and benefit from synergy.

# Glossary

**capacity reserve**

Generating capacity available to cover generating equipment failures and uncertainties in runoff and demand.

**distributed generation**

Electricity generation by small independent units installed on customers' premises (gas microturbines, fuel cells, solar panels, wind turbines, etc.).

**energy reserve**

Electrical energy (in particular, energy stored in the form of water in reservoirs) that the company can use to make up for any runoff deficit.

**fuel cell**

An electrochemical electricity generation system in which the chemical energy in a fuel is tapped for direct generation of electric current.

**market niche**

A small market segment for a given product or service, which is either undeveloped or underdeveloped and can be tapped to meet the needs of a particular group of customers.

**merchant transmission line**

An interconnection line on which available transmission capacity is sold at rates based on the price differential between the interconnected markets.

**power exchange**

A public marketplace where buyers and sellers of electricity can negotiate transactions under prevailing market conditions.

**regional transmission organization (RTO)**

A body operating independently from energy market participants and mandated by transmission providers to assume such responsibilities as managing power transactions, establishing the terms and conditions governing transmission loading relief, and coordinating activities aimed at ensuring the reliability of transmission systems in such a way as to provide non-discriminatory open access.

**upstream gas sector**

Sector of the gas industry that includes operations preceding the transportation of natural gas (research, exploration, production and processing).

**useful life**

Period of time over which an asset may be expected to perform its intended function if operated under normal conditions in compliance with design specifications.

**venture capital**

Capital invested in an innovative business undertaking (cutting-edge technologies, new ideas, etc.). In return for greater risk, investors hope for above-average returns.

**wheel-out, wheel-in**

The transmission of electrical energy to a power system in a control area other than the one in which it was generated.

**Units of measure**

| | |
|---|---|
| **$M:** | millions of dollars |
| **W:** | watt<br>A unit for measuring power |
| **kW:** | kilowatt<br>One thousand watts |
| **MW:** | megawatt<br>One million watts |
| **GW:** | gigawatt<br>One million kilowatts |
| **Wh:** | watthour<br>A unit for measuring electric energy |
| **GWh:** | gigawatthour<br>One million kilowatthours |
| **TWh:** | terawatthour<br>One billion kilowatthours |

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